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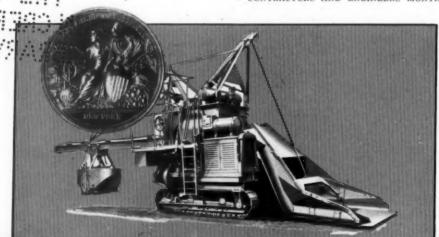
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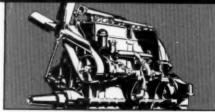


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Oklahoms P. C. Co., Denver.
Olympic P. C. Co., Ltd., Seattle.
Oregon P. C. Co., Portland, Ore.
Pacific P. C. Co., Denvir, Mich.
Peninaular P. C. Co., Detroit, Mich.
Peninaular P. C. Co., Detroit, Mich.
Peninaular P. C. Co., Petoskey, Mich.
Penna-Allon Cement Co., Allentown, Pa.
Petoskey P. C. Co., Petoskey, Mich.
Phanix P. C. Co., Petoskey, Mich.
Phanix P. C. Co., Patoskey, Mich.
Phanix P. C. Co., Patoskey, Mich.
Phanix P. C. Co., Des Moines.
Rish Plate Glass Co., Zanesville, O.
P. C. Co. of Utah, Salt Lake City.
Pyramid P. C. Co., Los Angeles.
Rish Marys Cement Co., Toronto, Can.
San Antonio P. C. Co., Cas Antonio.
Sandusky Cement Co., Cleveland, O.
Sants Crus P. C. Co., Cas Antonio.
Signal Mountain P. C. Co., Chatta., Tenn.
Southwest'n P. C. Co., Rockport, Ga.
Southwest'n P. C. Co., Cleveland.

Southwest'n P. C. Co., Los Angeles, Cal.
Standard P. C. Co., Cleveland.
Sun P. C. Co., Portland, Ore.
Superior P. C. Co., Seattle, Wash.
Texas P. O. Co., Dallas, Tex.
Three Forks P. C. Co., Baltimore, Md.
Trinity P. C. Co., Denver, Colo.
Tidewater P. C. Co., Baltimore, Md.
Trinity P. C. Co., Denver, Colo.
U. S. P. C. Co., Denver, Colo.
U. S. P. C. Co., Denver, Colo.
Universal P. C. Co., Chicago.
Utah Idaho Cement Co., Ogden, Utah.
Virginis P. C. Co., Philadelphia.
Valeanite P. C. Co., Philadelphia.
Warrior Cement Corp., Chatta., Tenn.
Wellaton Iron Furnace Co., Jackson, O.,
Wolverine P. C. Co., Coldwater, Mich.
Wyandotte P. C. Co., Detroit.

CEMENT BLOCK MACHINES *Cement Block Machy. Co., Newark, M.J.

CEMENT GUNS
*Cement Gun Co., Allentown, Pa.

CEMENT INSPECTION (See Inspecting Laboratories) CEMENT TOOLS
Abrama Cement Tool Co., Detroit.

CENTRIPUGAL PUMPS (See Pumps,

**Chain Belt Co., Milwaukee, Wis.

*Link-Belt Co., Chicago.

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Columbus McKinnon Chain Co., Columbus, O.

Diamond Chain & Mfg. Co., Indian-apolis, Ind. J. Grieve Mfg. Co., Columbus, O. U. S. Chain & Forge Co., Pittsburgh, Pa. Webster Mfg. Co., Chicago. Weller Mfg. Co., Chicago.

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Rust Engineering Co., Pittaburgh, Pa.
Weber Chimney Co., Chicago.

CHIMNEYS, EADIAL BRICK
Amer. Chimney Corp.. N. Y.
Continental Chimney Co. of Chi., Chicago
Alphons Custodis Chimney Const.Co.N.Y.
Heine Chimney Co., Chicago,
H. R. Heinicke, Inc., Indianapolis, Ind.
M. W. Kellogg & Co., N. Y.
Rust Eng. Co., Pittaburgh, Pa.

CHIMNEYS, STEEL (See Stacks, Steel)

CHLORINATORS Wallace & Tiernan Co., Inc., Newark,

CHLORINE, LIQUID (See Liquid Chlorine)

CHUTES, CONCRETE

*Insley Mfg. Co., Indianapolis, Ind.

*Lakewood Eng. Co., Cleveland, O.

*Ransome Conc. Mchy. Co., Dunellen, N.J.

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*Denver Rock Drill Mfg. Co., Denver
*Sullivan Machy Co., Chicago
Chicago Pneumatic Tool Co., New York
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CLAY PIPE (See Pipe, Vitrified Clay)

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Amer. Hoist & Derrick Co., St. Paul. Minn. scher & Hayes Rope & Steel Co., Pischer & Hayes Rope & Steel Co., Chicago, Thos. Laughlin Co., Portland, Ms., Marion Malleable Ir. Wks., Marion, Ind. C. M. Mockbee & Co., Cincinnati, O. John A. Reebling Sons Co., Trenton, N.J. Upson-Walton Co., Cleveland, O.

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*Link-Belt Co., Chicago.

*Waukesha Motor Co., Waukesha, Twin Disc Clutch Co., Racine, Wis.

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*Barber-Greene Co., Aurora, III.

*Chain Belt Co., Milwankee, Wis.

*Chicago Automatic Conv. Co., Chicago.

*Good Roads Mchy. Co., Kennett Sq., Fa.

*Geo. Haiss Mfg. Co., W.

*Link-Belt Co., Chicago.

*Mead-Morrison Mg. Co., B. Boston, Mass.
Austin Mfg. Co., Chicago
C. O. Bartiett & Snow Co., Cleveland, O.
Brown Hoisting Mchy. Co., Cleveland, O.
Fairfield Eng. Co., Marion, O.

Granite Construction Co., Watsonville, Calif., (see photo at the right) report:

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BIDDS.

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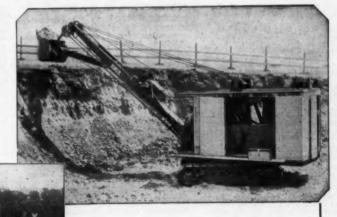
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*Sterling Wheelbarrow Co., Milwankes.
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Kiel Mach. Co., Kiel, Wis.
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Carnegie Steel Co., Ritsburgh, Pa.
Concrets Steel Co., Ritsburgh, Pa.
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W. Electric Welding Co., Pittsburgh, Pa.
Fi. Pitt Bridge Wks., Pittsburgh, Pa.
General Friegr. Bidg. Prod., Youngstown, O.,
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Kalman Steel Co., Chicage.
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National Steel Fabric Co., Pittsburgh,
J. T. Ryerson & Son, Chicage.
Wickwire-Spencer Steel Co., M. T.
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Johns-Mansville, Inc., N. Y.
National Fireproding Co., N. Y.
Ric-wil, Co., Cleveland.

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*Chain-Selt Co., Chicago.

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*Jes. Honhorst Ge., Clucinnatt, G.

*Link-Belt Ge., Chicago.

*Masd-Morrison Mig. Ge., B.Boston, Mass.

*Rassell Grader Mig. Ge., Minneapolis.

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Guarantee Constan. Co., N. Y.

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Gilman Mgc. Co., East Bosten, Mass.
Ingersoll-Rand Co., N. Y.
W. H. Keller, Inc., Grand Haven, Mich.

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*Mead-Merrison Mig. Co., Boston

*Orton Crane & Shovel Co., Chicago

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*Thew Shovel Co., Lorain, Ohio

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Terry Mig. Co., N. Y.

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*Brie Steam Shovel Co., Erie, Pa.
*Kochring Co., Milwaukes.
*Link.Belt Co., Chicago.
*Orton Crane & Shovel Co., Chicago.
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*Mead-Morrison Mfg. Co., Boston
*Speeder Machy. Corp., Cedar Bapids, Ia.
*Thew Shovel Co., Lorain, O.
Amer. Het. & Derrick Co., Bt. Paul,
Minn.
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Browning Crane Co., Cleveland, O.
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Hanna Eng. Works, Chicago.
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Ill.

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Morgan Eng. Co., Alliance, O.
Northern Eng. Wks., Detroit, Mich.
Shaw Crane Wks., Muskegon, Mish.
Shepard Elec. Cr. & Hat. Co., Monteur
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*Dobbie Fdry. & Mach. Co., Niagara Falis

*Insley Mfg. Co., Indianapolis, Ind.
Amor. Hst. & Derrick Co., St. Paul.
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Atia Corp., New York.
Lidgerwood Mig. Co., N. T.
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*Bay City Dredge Wks., Bay City, Mich.
*Clyde Ir. Wks. Sales Co., Duluth, Minn.
*Dobbie Fdry. & Mach. Co., Niagars Falls
*Orton Grane & Shovel Co., Chicage.
Amer. Hat. & Derrick Co., St. Panl.
Hayward Co., N. Y.
Nat'l. Hutg. Eng. Co., Harrison, N. J.
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Lidgerwood Mfg. Co., M. Y.
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*Ineley Mig. Co., Indianapolis, Ind.
*Ransome Cone. Michy. Co., Dunellen, N.J.
Archer Iron Works, Chicago.

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DRAFTING MACHINES
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**Orton Orane & Shovel Co., Chicage.

**Amer. Steel Dredge Co., Ft. Warne, Ind.

Buoyras Co., So. Milwaukes, Wis.

Ellicott Machy. Corp., Baltimore

Hayward Co., N. T.

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*Sullivan Machy. Co., Chicago.
Ingersoll-Rand Co., N. Y.

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Denver Ecck Drill Mig. Co., Denver.

*Bardsog Wonder Drill Co., Ottumwa, Is.

*Bullivan Machy. Co., Chicago.

Chicago Pneum. Tool Co., N. Y.

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Gliman Mig. Co., Et. Boston.

Helwig Mig. Co., St. Faul, Minn.

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Wood Drill Was., Paterson, N. J.

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C. Ridgway & Son Co., Coatesville, Pa.
A. B. See Elec. Elev. Co., N. Y.
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*CHIMAX Eng. Co., Clinton, Ia.
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*John Lausen Mfg. Co., New Holstein,

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*Stever Mfg. & Eng. Co., Preepert, Ill.
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*Wankesha Motor Co., Wankesha, Wis.
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Murray Iron Wka., Burlington, Is.
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Under Excavators, also Steam Shovels)

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*Glyde Ir. Wiss. Sales Co., Dulnth, Minn.

*Brie Steam Shovel Co., Erie, Fa.

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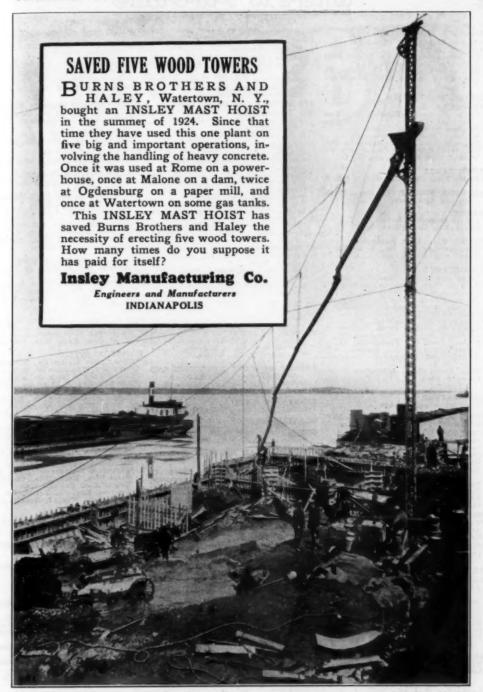
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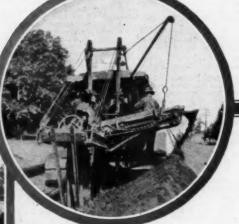
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*Blaw-Khox Co., Pittsburgh, Pa.
*Bliystone Mfg. Co., Cambridge Spgs., Pa.
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*Jaeger Machine Co., Columbus, Ohie
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*T. L. Smith Co., Milwaukee, Wis.
Anchor Mfg. Co., Chieago
C. H. & E. Mfg. Co., Milwaukee, Wis.
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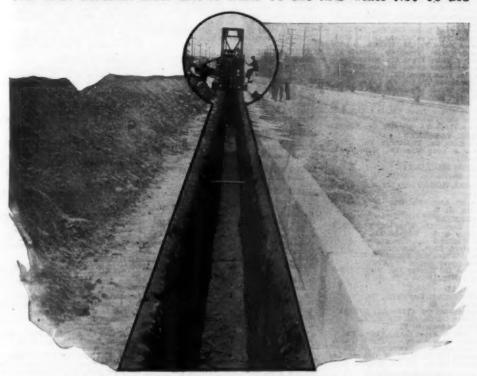
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e-John Lausen Mfg. Co., New Helstein,

Wils.

*Kinney Mfg. Ce., Bosten

*Nove Engine Ce., Lansing, Mich.

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Buda Co., Harvey, Ill.

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Dayton-Dewd Co., Quiney, Ill.

Daming Co., Salem, C.

Emerson Pump & Valve Co., Alexandria, Va.

Deming Co., Baiem, U.
Emerson Pump & Valva Co., Alexandria, Va.
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Goulda Pumps, Inc., Seneca Falls, N. Y.
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LeCourteasy Co., Newark, N. J.
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**Domestic Eng. & Pump Co., Shippensburg, Pa.

**Bumphryes Mig. Co., Mansfield, O.

**Construction Mchy. Co., aterice, Ia.

**Nove Engine Co., Lansing, Mich.

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Atis Corp., New York.
F. Bissell Co., Toledo, O.
Champion Corp., Hammond, Ind.
Solf Propelling Nossic Co., N. Y.
Turbine Sewer Mach. Co., Milwaukee.

SEWEE PIPE AND DRAIN TILE
American Vit. Prod. Co., Akron. O.
Blackmer & Post Pipe Co., St. Leuis.
Wm. E. Dec Co., Chicago.
Denver Sewer Pipe & Clay Co., Denver.
Co.

Col.

Col.

Dickey Clay Mfg. Co., K. City, Me.

Logan Clay Prod. Co., Logan, O.

Ohio Vit. Pipe Co., Uhrishaville, O.

Robinson Clay Prod. Co., Akren, O.

SEWER PIPB PORMS

*Heltzel Stl. Form & Ir. Co., Warren, O.
Quinn Wire & Iron Wks., Boons, Ia.
Raber & Lang Mfg. Co., Kendallville,
Ind.

SEWER PIPE JOINT COMPOUNDS

Pacific Flush Tank Co., Chicage & M. Y.
G. K. Sales Agency, Macungis, Pa.
Ruberoid Co., N. Y.
Bervicised Prod. Corp., Chicage

SEWER BODS

F. Bissell Co., Toledo, O.
Champion Corp., Hammend, Ind.
P. J. Healy, Jersey City, M. J.
Luck Sewer Equip. Co., Chicage,
Turbine Sewer Mach. Co., Milwankee.

SHARPENERS, DRILL STEEL.

*Denver Eock Drill Mfg. Co., Denver, Col.

*Hardsocg Wonder Dr. Co., Ottumwa, Ia.

*Sullivan Machy Co., Chicage
Ingersoll-Rand Co., New York

Robins Course Reveal & Chuts Co., Chicago.

Chicago.
Chicago.
Websiter Mfg. Co., Chicago.
Webler Mfg. Co., Chicago.
Wickwire Bpancer Bisel Co., N. Y.
CHIRBAS, SEWAGE
Links SEWAGE
Links SEWAGE
Links SEWAGE
Links SEWAGE
Links SEWAGE
Links Co., Chicago.
Wickwire Bpancer Bisel Co., N. Y.
Chicks Seli Co., Philadelphia.
Dorr Co., New York.
Green Bay Pdty. & Mash. Wks., Green
Bay, Wis.
Sanitation Corp'n., N. Y.
Simplex Ejector Co., Chicago.
EWAGE DISINFECTION
Webling Mill Co., Newport, Ky.
Penn Metal Co., Tiffin, O.
Weeling Metal Mfg. Co., Wheeling.
Weeling Metal Mfg. Co., Wheeling.

Dayton Sure Grip & Shore Ce., Dayton, O.,
M. & M. Form Clamp Co., Minneapolls
The O. D., Co., Owensbore, Ky.
H. W. Ross Co., Cincinnati, O.
Ross Meyer-Hecht Ce., Cincinnati, O.
Symons Clamp & Mfg. Ce., Chicage,
Universal Form Clamp Co., Chicage. Dayton Sure Grip & Shore Co., Day-

SHORES

SHOVELS, CRAWLING TRACTOR
'SErie Steam Shovel Co., Erie, Pa.
'Thew Shovel Co., Lorain, Ohio
Amer. Hst. & Derrick Co., St. Paul.

Ather. Hist. & Defrick Co., St. Paul.

SHOVELS, ELECTRIO

"Bay City Dredge Wks., Bay City, Mich.

"Byers Mach. Co., Ravenna, O.

"Koshring Co., Miwankee, Wiz.

"Link-Beit Co., Chicago.

"Speeder Machy. Corp., Cedar Rapids, Iz.

"Thew Shovel Co., Lerain, O.

"Amer. Hist. & Derrick Co., St. Paul.

Bucyrus Co., So. Milwankee, Wis.

Marion Steam Shovel Co., Marion, O.

Osgood Co., Marion, O.

SHOVELS, GASOLINB

*Bay City Dredge Wks., Bay City, Mich.
*Byers Mach. Co., Eavenna, O.
*Erie Steam Shevel Co., Erie, Pa.
*General Excavator Co., Marion, O.
*Insisy Mfg. Co., Indianapolis.
*Koehring Co., Milwaukee, Wis.

**Mead-Morrison Mfg. Co., Bester **Mead-Morrison Mfg. Co., Bester **Orton Crane & Shovel Co., Chicage. **Speeder Machy. Corp., Cedar Rapids, Ia. **Star Drilling Machine Co., Akron, O. **Thew Shoved Co., Lorain, O. **Universal Power Shovel Co., Destroit. Amer. Hst. & Derrick Co., St. Paul. Amer. Steel Dredge Co., Ft. Wayne, Ind. Austin Mach. Corp., Muskegon, Mich. Brown Hstg. Machy. Co., Cleveland, O. Bucyrus Co., Sc. Milwankee, Wis. Harnischfeger Corp., Milwankee, Wis. Marion Steam Shovel Co., Marion, O. McMyjer Interstate Co., Cleveland, O. Osgood Co., Marion, O.

SHOVELS, GASOLINE (FORDSON)

*Insley Mfg. Co., Indianapolis, Ind.

*Universal Fower Shovel Co., Detroix.
Anthony Co., Streator, III.
Hughes-Keenan Co., Cleveland.
Mandt Company, Reokuk, Ia.
Milwaukee Elec. Crane & Mfg. Co.,
Milwaukee.
Squier-Rix Co., Milwaukee.

Squiar-Rix Co., Milwaukee.

SHOVELS, HAND
American Mfg. Ce., Chattanooga, Tena.
Ames Shovel & Tool Co., Boston.
Baidwin Tool Wks., Parkersburg, W. Va.
Beall Bros. Co., Alton, Ill.
Connesat Shovel Co., Connesat, O.
Hubbard & Co., Pittsburgh, Pa.
Indiana Shovel Co., Menpelier, Ind.
Jackson Shovel Co., Menpelier, Ind.
Pittsburgh Shovel Co., Aliquipps, Pa.
Stevens-Webb Co., Inc., Alicona, Pa.
Union Farnacce Mfg. Co., Alicona, Pa.
Wood Shovel & Tool Co., Piqua, O.
Wyoming Shovel Wks., Wyoming, Pa.
SHOVELE, STRAM

Wyoming Shovel Wks., Wyoming, Pa.
SHOVELS, STRAM

*Erie Steam Shovel Co., Brie, Pa.
*Ksystone Driller Co., Beaver Palls, Pa.
*Orton Orane & Shovel Co., Chicago.

*Thew Shovel Co., Lorain, O.
Amer. Hst. & Derrick Co., St. Panl.
Bellwood Stm. Shovel Co., Bellwood, Pa.
Becyras Co., So. Milwaskes, Wis.
Industrial Wks., Bay City, Mich.
Marion Steam Shovel Co., Marion, O.
Cagood Co., Marion, O.
Russell & Co., Massillon, O.

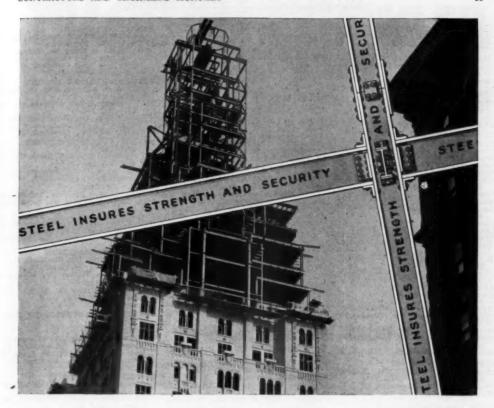
SIDEWALK AND ROAD FORMS (See Perms, Concrete)

Alumoyd Sign & Signal Co., Chicago.
Auto Sign Display Co. of Mo., St.
Louis, Mo.,
Baltimore Enam. & Nov. Co., Baltimore.
Elkhart Fdry. & Mach. Co., Eikhart,

Evernn-Century Sign Co., Boston, Ingram-Richardson Mfg. Co., Beaver Falls, Pa.

Falls, Pa.
Lyle-Signs, Minneapolis, Minn.
Municipal Street Sign Co., N. Y.
Rochester St. Signal Co., Rochester, N.Y.
Standard Mfg. Co., Cedar Falls, Ia.
Union Iron Prod. Co., E. Chicago, Ind.
Western Stamping & Mfg. Co., St. Paul

SIGNS, TRAFFIC Acme Traffic Signal Co., Les Angeles. Alumoyd Sign & Signal Co., Chicage. Amer. Gas Accumulator Co., Elizabeth, Amer. Gas Accumulator.
N. J.
Auto Sign Display Co. of Mo., St.
Louis, Mo. Auto Sign Display Co. of Mo., St. Louis, Mo. Automatic Signal & Sign Co., Canton, O. Crouse-Hinds Co., Syracuse, N. Y. Eikhart, Fdry. & Mack. Co., Eikhart, Ind. Essco Mfg. Co., Peoria, Ill. Evernu-Century Sign Co., Boston. Griswold Bafety Signal Co., Minneapolis Horal Signal Mfg. Corp., Newark, N. J. Line Material Co., Se. Milwarke, Wis. Little Giant Co., Mankato, Minn. Lyle-Signs, Minneapolis, Minn.



"NO ONE HAD TOLD ME"



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ile J. A BUSINESS man said to his club-car companion, "Yes, of course my new building is of steel construction, although

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Universal Traffic Control Co., Oklahoma
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SMOKE STACKS (See Stacks, Steel)
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"Austin-Western Rd. Mchy. Co., Chicage.
"Basker Mfg. Co., Springfield, Ill.
"Bayers Mach. Co., Aurora, Ill.
"Byers Mach. Co., Ravenns, O.
"Caterpullar Tractor Co., San Leandre,
Cetif. and Peoris, Ill.
"Cleveland Tractor Co., Gleveland, O.
"Clood Eds. Mach. Co., Kennett Sq., Pa.
"La Plant-Choate Mfg. Co., Gedar Rapids,
IA.

Ia.

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*Macd-Morrison Mfg. Co., B. Bosten.

*Monarch Tractors Corp. Springfield, Ill.

*Enssell Grader Mfg. Co., Minneapolis.

Austin Mfg. Co., Chicago.

C. D. Edwards Mfg. Co., Albert Lea,

Austin Mfg. Co., Chicago.
C. D. Edwards Mfg. Co., Albert Las,
Minn.
Hiway Service Corp., Wausau, Wis.
Killefer Mfg. Co., Los Angeles, Cal.
Linn Mfg. Co., Morris, N. Y.
Owensboro, Ky.
Rotary Snow Plow Co., Minneapolis.
Shaw-Enochs Tractor Co., Minneapolis.
W. M. Toy Co., Sidney, O.
Union-Iron Wks., Inc., Bangor, Me.
Walshs Holyoke St. Bir. Wks., Holyoke,
Mass. Walter Snow Fighters, L. I. City, N. Y.

SNOW PENCING ow Finding the Co. Kennets Square, Pa. Square, Pa. Yolone Fence Co., Waukegan, Ill. Ylokwire-Spencer Steel Co., N. X.

SPADES (See Shovels) SPRAYERS, ASPHALT AND TAB *Littleford Bros., Cincinnati. Kinney Mfg. Co., Boston.

SPRAYING MACHINERY FOR TRHES Bean Spray Pump Co., Lansing, Mich. Field Force Pump Co., Elmira, N. Y. Fitsheary-Guptill Co., E. Cambridge,

SPREADERS, STONE

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*Galion Ir. Wks. & Mfg. Co., Galion, O.
Burch Corp'n., Crestline, O.
Shaw-Enochs Tractor Co., Minneapolis.

Shaw-Enochs Tractor Co., Minneapolls.
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Connery & Co., Inc., Philadelphis.

Heil Co., Milwankes, Wis.

Jos. Hoshorst Co., Cincinnatt, C.

Littleford Bros., Cincinnatt, C.

Birmingham Tank Co., Birmingham Ala.

Chatts. Boiler & Tank Co., Chatts., Tens.

Chicago Bridge & Iron Wks., Chicago.

Graver Corp., Chicago.

N. Y. Central Iron Wks. Co., Inc.,

Hagerstown, Md.

Petroleum Iron Wks. Co., Sharon, Pa.

Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.

W. B. Scatte & Sons. Pittsburgh, Pa.

Walsh & Weidner Boiler Co., Chatta
moogs, Tons.

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R. D. Cole Mfg. Co., Newnan, Ga. Lancaster Iron Wks., Lancaster, Pa. Pacific Tank & Pipe Co., San Francisco. Petroleum Ir. Wks. Co., Sharon, Pa. Pittsburgh-Des Moines Steel Co., Pitts burgh, Pa.

burgh, Pa. United Iron Wks., Inc., K. City, Mo. Walsh & Weidner Boiler Co., Chatta-nooga, Tenn. STRAM SHOVELS (See Shovels, Steam)

STEAM TURBINES (See Turbines)

STEAM TURBINES (See Turbines)

STEEL PLATE CONSTRUCTION

*Blaw-Knex Co., Pitisbargh, Pa.

*Connery & Co., Phindeiphia.

*Hell Co., Milwankos, Wis.

*Hell So., Milwankos, Wis.

*Hell So., Milwankos, Wis.

*Hell So., Milwankos, Co., Warren, O.

*Jos. Honborst Co., Cincinnati, O.

*Union Iron Whs., Inc., Heboken, M. J.

*Union Iron Whs., Inc., Heboken, M. J.

Bathlehem Steel Co., Bethlehem Pa.

Biggs Boller Wks., Akron, O.

Birmingham Tank Co., Chatta., Tens.

Chicago Bridge & Iron Whs., Chicago,

Graver Corp., E. Chicago, Ind.

Hendrick Mig. Co., Carbondala, Pa.

McClintic Marshall Co., Pittsburgh, Pa.

M. Y. Central Iron Wks. Co., Inc.,

Hageratown, Md.

Penna. Bridge Co., Beaver Falls, Ia.

Petroleum Iron Wks. Co., Sharon, Pa.

Pittsburgh-Des Moines Steel Cs., Pitts
burg, Pa.

Riter-Conley Co., Tittsburgh, Pa.

W. B. Seaife & Sons, Pittsburgh, Pa.

Tolede Crane Co., Toledo, O.

Walsh & Weldner Bir, Co., Chatta., Tenn.

*Wemlinger, Inc., N. Y.

STEEL TOWERS, CONCRETE
*Insley Mig. Co., Indianapolis, Ind.
*Ransome Conc. Mchy. Co., Dunellen,N.J.

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Automatic Furnace Co., Dayton, O.
Baboock & Wileoz Co., N. Y.
Combustion Engineering Corp., N. Y.
Detroit Stoker Co., Detroit,
Sanford Riley Stoker Co., Worcester,
Wass Westinghouse Eles. & Mfg. Co., E. Pittsburgh, Pa.

Pittsburgh,
Pittsburgh,
Pittsburgh,
Preet And Road

Treet Cleanres Care (Co., Rochester, N. Y.)
Tarrant Mfg. Co., Saratoga Springs, N.Y.

Street Flushers and Sprinklers

Austin-Western Rd. Mchy. Co., Chicage.

Galion Ir. Whs. & Mfg. Co., Galion, O.
Heil Co., Milwaukse, Wis.

*Minney Mfg. Co., Beston.

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Whitehead & Kales Co., Detroit.
Austin Mfg. Co., Chicago
Autocar Co., Ardmers, Pa.
E. D. Etnyre & Co., Oragon, Ill.
Federal Motor Truck Co., Detroit.
Chas. Hvass & Co., M.Y.

Municipal Supply Co., So. Bend, Ind.
White Co., Cleveland, O.,
Yellow Truck & Coach Mfg. Co., Chicago

Yellow Truck & Coach Mfg. Co., Chicago

Street Lamp Posts

Street Lamp Posts

Gone, Chicago,
Co., Cincinnati, O.

Gone, Chicago,
Co., Cincinnati, O.

Gone, Chicago,
Co., Cincinnati, O.

Birmingham Tank Co., Birmingham, Ala.
J. I. Case Threshing Mach. Co., Racine,
Wis.
W. E. Caldwell Co., Lonisville, Ky.
Chatta Boiler & Tank Co., Chatta
"An College Co., Millersville, Pa.
Biggs Boilor Wks., Akron, O.
Birmingham Tank Co., Birmingham, Ala.
J. I. Case Threshing Mach. Co., Chatta
"An College Co., Millersville, Pa.
Biggs Boilor Wks., Akron, O.
Birmingham Tank Co., Birmingham, Ala.
J. I. Case Threshing Mach. Co., Racine,
Wis.
W. E. Caldwell Co., Lonisville, Ky.
Chatta Boiler & Tank Co., Chatta
"An Chicago.

Independent Prunp
Ingersoll-Rand Co., N. Y.
Lancaster Iron Wks., Lancaster.
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Ingersoll-Rand Co., N. Y.
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STREET SWEEPERS

*Austin-Western Ed. Michy. Co., Chicago.

*Kinney Mfg. Co., Boston.

*Whitehead & Kales Co., Detroit.

Austin Mfg. Co., Chicago.

Batler Mfg. Co., Cleveland. O.

Elgin Sales Corp., N. Y. FREST SWEEPING BROOMS
Ind. Brush & Broom Mfg. Co., Indianapolis, Ind.

Ind. Brush a Brush Co. Ken-polis, Ind.
Kendallville, Ind.
Lang Broom Co., Pittsburgh, Pa.
Jos. Lay Co., Portland, Ind.
Osborn Mfg. Co., Cleveland, O.

Osborn Mig. Co., Uleveland, U.
STREET SWEEPING BROOMS
HEPTILIED

Kendaliville Broom & Brush Co., Kendaliville, Ind.
Lang Broom Co., Pittsburgh, Pa.
Osborn Mig. Co., Claveland, O.
STUMP PULLBES

"Clyds Ir. WKs. Sales Co., Dulnth, Minn.
"La Plant-Cheate Mig. Co., Cedar Rapids,
Ta.

Ia.

Tander Machy. Mfg. Co., Fortland, Ore.

Erated Machy. Mfg. Co., Westerville, O.

Thomas Elevator Co., Chicago.

John Waldron Corp., New Brunswick,

N. J.

John Waldron Corp., New Brunswick, N. J. SUBGRADING MACHINES *Lakswood Eng. Co., Cleveland, O. The Hug Co., Highland, Ill. Shaw-Enochs Tractor Co., Minneapolis.

SUPERHEATERS
Babenek & Wilcox Co., N. Y.
Power Specialty Co., N. Y.
Superheater Co., N. Y. SURVEYORS' INSTRUMENTS (See In-

SWITCHBOARDS
Allis-Chalmers Mfg. Co., Milwaukes.
General Eles. Co., Schemetady, N. T.
Wagner Eles. Mfg. Co., St. Louis, Mo.
Westinghouse Eles. & Mfg. Co., E.
Pittaburgh, Pa.

TAMPING MACHINES
Cement Block Mchy. Co., Newark, N. J.
Chicago Fraeum. Tool Co., N. Y.
Harnischfeger Corp., Milwaukee, Wis.
Ingersoll-Rand Co., N. Y.

Ingersoil-Rand Co., N. Y.

TANKS, AIR COMPRESSOE

*Connery & Co., Inc., Philadelphia.

*Courtis Presum. Mchy. Co., St. Louis, Mo.

*Hail Co., Milwaukee, Wis.

*Littleford Bros., Cincinnatt, O.

Biggs Boiler Wks., Akron, O.

Birmingham Tank Co., Birmingham, Ala.

Chicago Pridgs & Iron Wks., Chicago

Chicago Presum. Tool Co., N. Y.

Graver Corp., E. Chicago, Ind.

Independent Presum. Tool Co., Chicago

Indians Air Pump Co., Indianapolis.

Ingersoil-Rand Co., N. Y.

Lancaster Iron Wks., Lancaster, Pa.

Petroleum Iron Wks., Co., Sharon, Pa.

Pittsburgh Des Moines Fisel Co., Pittsburgh, Pa.

* Indicates that the manufacturer carries an advertisement. See index facing inside back cover.*

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"Crawlers"-Get Them Inand Out!

NDER the most difficult ground conditions, the Trackson takes the Fordson through with full load. Trackson gives it sure-footing at all times and together with the Fordson forms a 2-ton crawler tractor that is unparalleled in performance and unequalled in economy.

In this crawler tractor you get the greatest track area for rough going; you get lowest ground pressure per pound of weight for work in mud, sand or swamp; you get increased drawbar power; you get an all-steel crawler that converts the Fordson into the most generally adaptable 2-ton crawler tractor on the market.

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MAKERS OF FULL-CRAWLERS — MILWAUKEE, WIS

These
6 Advantages Are
Combined in no
Other Crawler

- All-steel construction—no cast iron parts.
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- 3. Patented non-clogging track of specially hardened alloy steel.
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Dover Boller Wks., N. Y.
Farrell Mfg. Co., Joliet, Ill.
C. O. Fonts Co., Middietown, O.
Graver Corp., E. Chicago, Ind.
R. Hardesty Mfg. Co., Denver, Col.
Hendrick Mfg. Co., Carbondale, Pa.
Lancaster Iron Wks., Lancaster, Pa.
M. Y. Central Irn. Wks. Co., Hagerstown, Md.
Pacific Tank & Pipe Co., San Francisco.
Petroleum Iron Wks. Co., Sharon, Pa.
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.

Pittaburgh-Des Moines Steel Co., Pitta-burgh, Pa. Riter-Conley Co., Pittaburgh, Pa. W. B. Sealfe & Sona, Pittaburgh United iron Wks., Inc., K. City, Mo. Walah & Weidner Boiler Co., Chattaalsh & Weidner Boiler Co., Chatta-nooga, Tenn, ayne Tank & Pump Co., Ft. Wayne,

Wayne Ind.

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G. M. Davis & Son, Palatka, Fla.
Eagle Tank Co., Chicago.
Hauser-Stander Tank Co., Cincinnati, O.
Kalamasoo Tank & Silo Co., Kalamasoo, Mich.
Nat'l. Tank & Pipe Co., San Francisco.
Redwood Mirs. Co., San Francisco.
Redwood Mirs. Co., San Francisco.
A. T. Stearns Lumber Co., Boston.
U. S. Wind Eng. & Pump Co., Batavis,
III. TIL Wendnagel & Co., Chicago.

TANK WAGONS

*Acmo Bd. Mach. Co., Frankfert, W. Y.

*Galien Ir. Wks. & Mfg. Co., Galien, O.

*Heil Co., Milwankee, Wis.

*Jos. Honhorst Co., Cincinnati, O.

*Mack Trucks, Inc., W. Y.

Butler Mfg. Co., Minneapolis, Minn.

J. I. Case Threshing Mach. Co., Racine.

TAPES, STEEL AND METALLIC *Lafkin Rule Co., Saginaw, Mich. Eugene Dietsgen Co., N. Y. Keuffel & Esser Co., Hoboken, N. J. The L. S. Starrett Co., Athol, Mass.

TAB KETTLES (See Kettles)

THAWING OUTFITS

*Aeroil Burner Co., West New York, N.J.

*Littleford Bros., Cincinnati.

Hauck Mfg. Co., Bklyn., N. Y.

TIE TAMPERS
Electric Tamper & Equip. Co., Chicago.

TIE BOLTS FOR WALL FORMS
Hawley Tie Bolt Co., Minneapolis

Carnegie Sieel Co., Pittsburgh, Pa. Int'l. Steel Tie Co., Cleveland, O. Koppel Ind. Car & Equip. Co., Koppel, Pa. Sweet's Steel Co., Williamsport, Pa.

TIMBER CLAMPS Pyle-Rogers Corp., N. Y.

TIRES, RUBBEE (For Motor Tracks)
Firestone Tire & Rubber Co., Akron, O.
Fisk Tire Co., Chicopee Falls, Mass.
Goodrich Rubber Co., Akron, O.
Goodyear Tire & Rubber Co., Akron, O.
Kelly Springfield Tire Co., N. Y.
U. & Tire Co., N. Y.

TOOL HOUSES, PORTABLE STREL *Blaw-Knox Co., Pittsburgh, Pa. *Littleford Bres., Cincinnati, O.

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**Littleford Bros., Cincinnati.
**Mead-Morrison Mrg. Co., E. Boston.
**Alex. Milburn Co., Baltimore, Md.
Chausse Oil Burner Co., Elkhart, Ind.
Hauck Mfg. Co., Bklyn., N. Y.

TOWERS (See Standpipe, Tanks and Towers)

TRACKS, INDUSTRIAL AMD PORTABLE
*Baston Car & Constn. Co., Baston, Pa.
*Lakewood Bug. Co., Cleveland, C.
Atlas Car & Mfg. Co., Cleveland, C.
Bethlehem Steel Co., Bethlehem, Pa.
Chase Fdry, & Mfg. Co., Columbus, O.
C. W. Hunt Co., Inc., W.N.Brighton, N.Y.
Koppel Ind. Car & Equip, Co., Koppel, Pa.
Sweet's Steel Co., Williamsport, Pa.

TRACTION TREADS
*Trackson Co., Milwaukee.
*Whitehead & Kales Co., Detroit.
Belle City Mfg. Co. Racine, Wis.
Tractor Grip Wheel Co., Toledo, O.

TRACTORS TRACTORS

*Caterpillar Tracter Co., San Leandre,
Colif.

*Cleveland Tractor Co., Cleveland, C.

*Geo. Haiss Mfg. Co., New York.

*Huber Mfg. Co., Marion O.

*J. T. Tracter Co., Cleveland, C.

*John Lauson Co., New Holstein, Wis.

*Mack Trucks, Inc., N. Y.

*Mead-Morrison Mfg. Co., B. Boston.

*Monarch Tracters Corp., Springfield, Ill.

Advance-Rumely Thresher Co., Laports,
Ind.

Allis-Chalmers Mfg. Co., Milwankes. Bates Mfg. Co., Joliet, Ill. Clark Truetractor Co., Battle Creek,

Clark Trustractor Co., Battle Creek, Mich, Mich, Emerson-Brantingham, Rockford, Ill. Ford Motor Co., Detroit, Mich. Hart-Parr Co., Charles City, Ia. Int'l. Harvester Co., Charles City, Ia. Int'l. Harvester Co., Minneapolls, Minn. Lombard Tractor & Truck Cerp., M. Y. Minneapolis Steel & Mach. Co., Minneapolis Rogers Bros. Corp., Albion. Pa. Rogers Bros. Corp., Albion, Pa. Shaw-Enochs Tractor Co., Minneapolis.

TRACTOR ACCESSORIES
*Trail-17 Co., St. Paul, Minn.
*Whitehead & Kales Co., Detroit.
Pickering Governor Co., Portland, Conn.

TRACTOR HITCHES
*Trail-iT Co., St. Paul. Minn.
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Hanline Bros., Baltimore, Md.
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Sewall Paint & Varnish Co., K. City, Mo.
Sherwin-Williams Co., Cleveland, O.
Tropical Paint & Oil Co., Cleveland, O.
Truscon Laboratories, Detroit, Mich.
Wamblu Paint & Varnish Works,
Rochester, N. Y.

TRAPFIC SIGNS (See Signs, Traffic) TRAILERS FOR TRUCKS AND

TRACTORS *Eagle Wagon Wks., Auburn, N. Y. *Easton Car & Const'in. Co., Easten, Pa. *Highway Trailer Co., Edgerton, Wis.. *La Flant-Choate Mfg. Co., Cedar Rapids,

*Whitehead & Kales Co., Detroit, Mich. Arcadia Trailer Corp., Newark, N. Y. Detroit Trailer & Mach. Co., Detroit Fruehauf-Trailer Co., Detroit, Mich. Hercules Trailer Mfg. Co., Los Angeles. Lee Trailer & Body Co., Chicago. Rex. Watson Corp., Canastota, N. Y. Rogers Bros. Corp., Albion, Pa. Squier-Rix Co., Milwaukes, Wis. Trail. Fact Co., Milwaukes, Wis. Trail. Fact Co., Man Arbor. Mich. Rex-Watson Corp., Usanasuosa, 21. 2. Rogers Bros. Corp., Albien, Pa. Squier-Rix Co., Milwaukes, Wis. Trail-Ford Co., Ann Arbor, Mich. Trailmobile Co., Cincinnati. Troy Trailer & Wagon Co., Troy, O. Warner Mfg. Co., Beloit, Wis.

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*Highway Trailer Co., Edgerton, Wis.
*Lakewood Eng. Co., Cleveland, O.
*La Plant-Cheste Mfg. Co., Godar Rapids,

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Miami Trailer-Scraper Co., Trey, O.

Miami Trailer-Scraper Co., Cleveland.

Gustav Schaefer Wagon Co., Cleveland.

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Chase Fdry. & Mfg. Co., Columbus, O.

Clark Tructractor Co., Battle Creek, Clark Truttreser Co., Mich. Co., Detreit. Mich. Detroit Trailer & Mach. Co., Detreit. Electric Wheel Co., Quincy, Ill. Lee Trailer & Body Co., Plymouth, Ind. Trailmobile Co., Cincinnati.

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Replacement)

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MOTOES (1 to 7 Tons)
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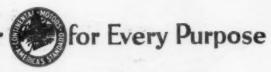
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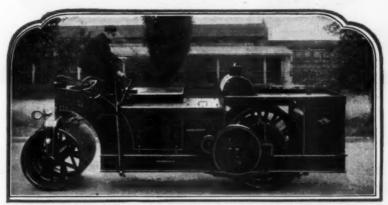
*TRAVELING WATER SCREENS *Chain Belt Co., Milwaukee.

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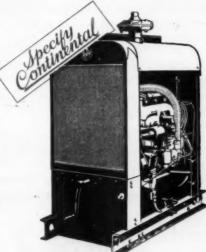
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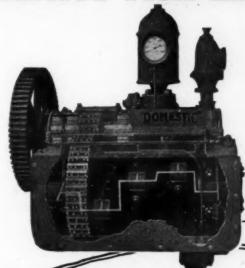
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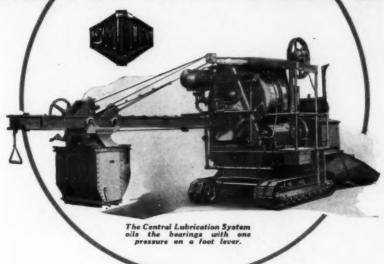
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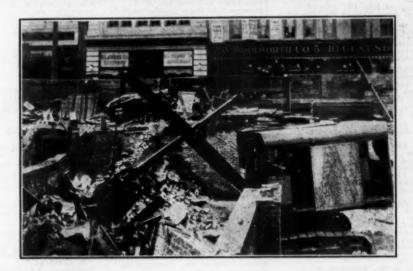
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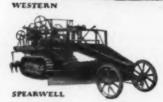
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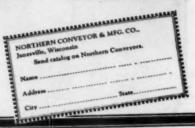
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Contractors gineers Monthly

July, 1927

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Contractors Engineers Monthly

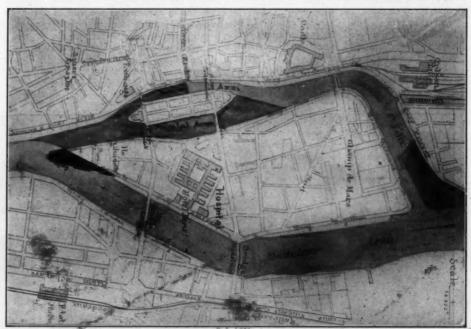
July, 1927

Dredging and Other Construction at the Port of Nantes

By AUGUSTIN E. DENYS
State Engineer of Public Works, Nantes, France

Provided that the partial filling in of the Arms of the Bourse and the Hopital at Nantes was the only practical means of safeguarding completely and definitively the stability of structures bordering these arms, which are threatened by a lowering low tide resulting from the dredging of the Maritime Loire.

Measures to deepen the channel and allow ships of greater draught to come up to Nantes were commenced about fifteen years ago. These measures comprised dredgings, the removal of islands and the construction of dikes of rock. The subsequent lowering of the lowest tide, as recorded by the tidemeter placed 1.24 miles down-stream from the above mentioned arms, was about 3.28 feet, while the low tide, as a matter of fact, did not change above Nantes. There was therefore a greater difference of level down-stream than up-stream, which mani-



MAP SHOWING THE LOIRE RIVER WITH THE ST. FELIX CHANNEL AND MADELEINE ARM, AS WELL AS THE BOURSE AND HOPITAL ARMS

The section of the island to be removed is indicated by the darkest area. The intermediate gray is the part to be filled in of the Bourse and Hopital Arms and on the St. Felix Channel

fested itself in an increase of the currents of the ebb-tide at low tide in the Arm of the Bourse, and a considerable lowering of the river-bed in this arm.

The foundations of the bank walls were not sunk deep enough when built. The undermining at their base, caused by the currents of the more rapid ebb-tide, was not immediately checked by rock dikes; hence, the abutments were weakened and there was evidence of settling in the walls and the platforms behind. Also, of course, there was evidence of settling in the walls of surrounding buildings, as a result of the movements in the earth behind the bank walls. It was such movements as these that caused the falling of the Maudit Bridge and of one of the archs of the Pirmil Bridge.

The projected fill, and the making of a platform on the right-hand side of the new proposed dam at the entrance of the St. Felix canal between the Malakoff and Ferdinand Favre Quays, are indicated on the accompanying map; the fill will be retained on the eastern side at the Arm of the Bourse by a retaining-wall and a low-dock wall in masonry of rough-stones joined with cement mortar, erected on a rock dam placed in the prolongation of the Erdre River, as indicated by the profile. Access to the lower dock and the quays will be by steps to be constructed on the left side.

At the Arm of the Hopital the fill will be held by a retaining-wall 820 feet in length, and by a low-dock wall 689 feet in length, of similar formation to that at the Arm of the Bourse, on a rock dike foundation constructed as a continuation of the wall and the Baco Ouay.

At the western side the fill will be limited by

an oblique masonry dike of rough-stones with cement mortar, crowned with a hand-railing, also of masonry, commencing at Deurbroucq Street (on the same side as the Tourville Quay), and extending to the right bank of the Loire River, near the Port Bureau and the works of the Compagnie Nantaise de Navigation a Vapeur. The end of Gloriette Island, situated at the western side of the last-named work, will be cut off in order that the lower part of the Arm of the Madeleine will have a cross-sectional area almost equal to the area of the Arm at the Haudaudine Bridge, 1,640 feet upstream.

The extent of this fill will be as follows: Arm of the Bourse: Length, 1,230 feet, average width, 115 feet, making a surface of 15,619 square yards, which will necessitate the use of 133,416 cubic yards of hydraulic filling.

Arm of the Hopital: Length, 3,116 feet, average width, 258 feet, making a surface of 88,893 square yards, necessitating 1,046,400 cubic yards of hydraulic filling, out of which 130,800 cubic yards will come from the removal of a portion of the island.

It is the opinion of the engineers that the filling in of these secondary arms of the Loire River will have no influence whatever on the flow of the river, owing to the rather important increase in capacity at the end of the Madeleine and Pirmil bridges, resulting from the reconstruction of these works and the removal of the westward end of Gloriette Island.

The filling in of the Arm of the Bourse, begun in 1926, was interrupted after the completion of the foundations of the low-dock walls and the quay walls, on a rock dam closing the



DREDGE LOADING SAND INTO BARGES FOR TRANSPORTATION TO THE BOURSE AND HOPITAL ARMS FOR FILL



RIVER DREDGE WITH SAND BARGE ALONGSIDE
At the right is seen the Maudit Bridge, and at the left the Bourse Bridge. The section of the island to be removed is seen at the extreme right

arm, in order to allow the construction of the sewer system down-stream and to permit the rock dikes to consolidate. This work will be resumed and completed during the present calendar year, as far as the right-hand side of the Petite Hollande Market, about 328 feet down-stream from the Bourse Bridge.

The filling in of the Hopital Arm must await the completion of the construction of the new Madeleine Bridge, the tearing down of the existing bridge, and the destruction of the old Pirmil Bridge, which is under way. It is hoped, however, that it will be possible to begin the filling in in 1928. These works include also the creation of a platform, level with the Malakiff Quay, at the entrance, and on the right of the St. Felix Channel. This platform will have a surface of 54,832 square yards and will necessitate the use of 418,560 cubic yards of hydraulic fill.

The entrance to this channel will therefore be reduced to a width of 164 feet for a distance of 892 feet. A sluice 148 feet in length and 20 feet in width, with metal locks, will be constructed at its lower end for the use of the boating trade in the Erdre River. The St. Felix Channel, from the sluice to the River Erdre, a distance of about 4,264 feet, will form a small basin. This will do away with the disagreeable odors of the river-bed at low tides in summer.

Hydraulic Fill

The sand for the fill comes from the Loire River. It is removed from the river-bed by bucket dredges, and is then put on lighters and towed by tugs to the site of the work.

The mechanical equipment for handling the fill is composed of two triple-expansion steam engines totaling 1,100 horsepower. The main steam engine drives a 700-horsepower motor, operating two pumps which together are able to pump 262 cubic yards of moderately fine sand per hour a distance of 2,952 feet. The auxiliary steam engine supplies a special motor of 400horsepower which handles the water-supply.

The 66,185 cubic yards of fill completed in the Arm of the Bourse has been done at the rate of 2,354 cubic yards per day. The length of pipe to the place being filled has in some cases been as much as 1,312 feet.

The scheme of partially filling in the Arm of the Bourse and the Arm of the Hopital, as established by Mr. Mabilleau, Engineer of the Road and Bridge Service, provides for the handling of private drains emptying into these arms, an operation which will necessarily precede the filling in. To these drains are added, as far as the Arm of the Bourse is concerned, two small drains serving exclusively during storms and belonging to the municipality, one 3.9 feet wide and 5.6 feet high, bordering the Post Office building on the Brancas Quay, and the other 4.9 feet wide and 6.6 feet high, under the Bourse Square.

Work on the consolidated drains of the Bourse Arm, which form a "Y," is to be started again within a short time and completed without interruption. These drains will have an average slope of 1 inch per 17.4 inches. They will comprise two series of cement water-pipes having an inside diameter of 1.6 feet, two series of egg-shaped sewers of 3.9x2.6 feet of concrete, 0.43 feet thick. The lower part will be made precast because of the water level of the river at low tide. There will also be a collecting sewer in cement mortar masonry 5.9 feet high and 3 feet wide based on an inverted arch



HYDRAULIC FILL BEHIND ROCK DIKE ON THE BOURSE ARM AT THE RIVER LOIRE

4.1 feet wide and 0.8 feet thick, joined together with cement mortar. These slabs will have stirrups of rods of 0.5 to 0.6 inch diameter, to facilitate handling. The piers of this collecting drain will be I foot thick at the base and 0.7 foot at the spandrel of the arch.

This net-work of sewers begins on the left bank, at 45.9 feet from the low-dock, and on the right bank 269 feet from this wall. For the time being, and until it is possible to fill in the Hopital arm, the net-work will include: on the left bank, 417 feet of cement pipe of 1.6 feet in diameter and 279 feet of egg-shaped sewer of 3.9x2.6 feet; on the right bank, 79 feet of cement pipe of 1.6 feet in diameter and 459 feet of egg-shaped sewer of 3.9x2.6 feet; and at the conjunction of these sewers and in the middle of the arm, 295 feet of collecting aqueduct of 5.9x3 feet.

Some of these pipes having an inside diameter of 1.6 feet are delivered in two sections each 3.3 feet long. The lower sections are laid on a cement-mortar bed 0.07 feet thick and the upper half-pipes are so laid as to break joints midway of the section. On each side, for their whole length, they rest on concrete lugs, as

shown on the profiles.

The lower half of the sewers of 3.9x2.6 feet will be laid with precast sections 1.6 feet long, placed in the excavation and held by wedges and temporary props. The upper half-section will be cast on the site in lengths of 33 to 66 feet. At the end of each 32.8-foot to 64.16foot section, a space 1.6 feet wide will be left to facilitate the removal of the forms. This space will be closed by precast sections.

The piers, as well as the rings of the sewers

made of precast slabs of concrete 1.6 feet long, of 5.9x3 feet, will be covered with a coat of quick cement, 0.03 foot thick. The vault will be covered with a cement mortar coat 0.07 foot thick, and the foundation protected by a coat 0.1 foot thick, also of cement mortar.

> A cement masonry chamber of proper dimensions is constructed at the conjunction of each sewer with the net-work of aqueducts in the arm; furthermore, 8 manholes of 2.6x2.6 feet, with a metal ladder 1.3 feet wide and 0.1-foot rounds having a space between them of 0.7 foot will be constructed in the whole length of the net-work of aqueducts in order to inspect the works and make eventual repairs.

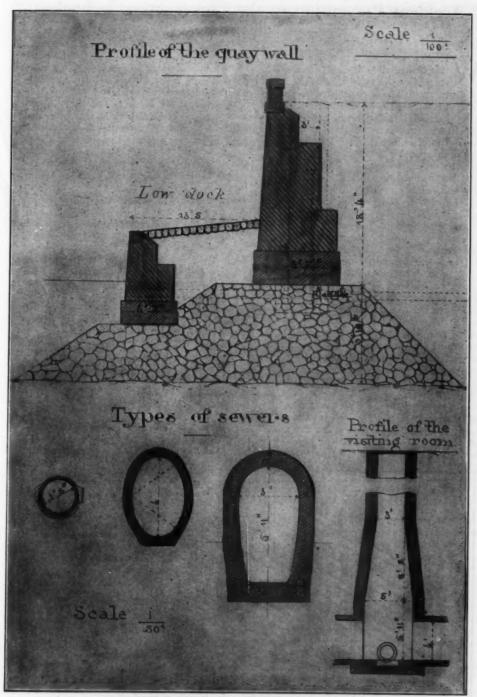
The net-work of drains is joined to the river, on the two banks of the Arm, through metal pipes of 0.82 foot in diameter, placed 1.5 feet under the tide level up-stream. These pipes, which pass through the low-dock wall and under the quay wall, will be provided with a coat of rough-cast bronze and a sluice gate 1.5 feet square in cast and bronze, placed at the lower part of the inspection chamber in the quay wall.

As planned, the works have been estimated to cost 20,000,000 francs, exclusive of the construction of the sewers, as follows:

Francs 770,000.00

5,600,000.00 7,100,000.00

The expense of the construction of sewers will be borne by the city of Nantes, and will amount to about 860,000.00 francs, of which 130,000.00 francs is for the part of the Arm of the Bourse and 730,000.00 francs for fill.



SECTIONS OF QUAY WALL AND SEWERS AT NANTES, FRANCE

Accident Prevention in the Construction Industry

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By D. H. DIXON

Vice-President, The Turner Construction Company, New York City

HEN a construction company considers the inauguration of an active campaign to reduce the number and severity of accidents, the first essential is that the executives of that company must convince themselves that such a campaign can be made effective. Every executive will sincerely desire fewer cases of injuries to employees, but the impression is so general that "accidents will happen" that the executives should each make a sufficient study of existing data to convince themselves that, while many accidents will happen in spite of everything within reason that can be done, there are also many accidents that can be prevented by systematic safety work.

A study of the Proceedings of the Construction Section of the National Safety Council will furnish a number of examples of encouraging progress by individual construction companies, but it must be admitted that the construction industry is far behind many other industries in the systematic effort to reduce accidents. Therefore, I believe the executive is more likely to be convinced by a study of the records of some of the large industrial organizations that have collected statistics covering considerable periods of time. A typical illustration is furnished by the United States Steel Corporation.

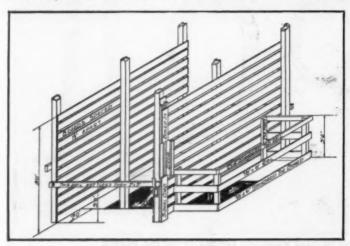
The United States Steel Corporation has reduced serious accidents 60 per cent in the period 1906 to 1925, and in the same period has reduced all accidents, including disabling minor accidents, 80 per cent. This means that where

100 men out of a given number were seriously injured in 1906, only 40 men out of the same number were seriously injured in 1925.

Other large industrial companies have achieved similar success. I believe these statistics are reliable and, while it must be recognized that a construction company faces a harder problem owing to the shifting locations of its operations and the wide fluctuations in the number of its employees, I am convinced that any reasonable man must admit that if the steel industry can accomplish so much, then the construction industry, by similar systematic effort, can accomplish very gratifying results.

I became thoroughly convinced that we can reduce accidents by studying the causes of a large number of accidents on the work of the company with which I am connected. I am positive that any executive who will study the causes of accidents on his own work for a period of five years or, if these are not available, will read the analysis referred to above, will become equally convinced that he can institute preventative measures which will effect a considerable reduction in the frequency and severity of accidents.

The executives of a construction company having convinced themselves that accidents are caused and don't just happen, and that it is possible to prevent a large number of them, it then becomes the duty of the executives to institute systematic measures of accident prevention so that the passive wish for fewer accidents may be converted into an actuality. I will discuss



ISOMETRIC
VIEW OP
PROPERLY PROTECTED
MATERIAL
PLATFORM HOIST
LANDING LOCATED
IN INTERIOR
SHAFTWAY

Note that the balance of the shaftway is protected with a standard railing and that the signal bell cord is boxed in a standard railing or substantial plank floor; protecting all portions of the shaftway not required by the platform car, is



REPRODUCTION OF A COVER OF THE "TURNER CONSTRUCTOR"—A DISTINCTIVE APPRAL FOR ACCIDENT PREVENTION

the formulation and operation of these preventative measures.

As a first step, every construction company should join the National Safety Council. The dues are nominal and the service it renders through its Construction Section will be found of great value.

Accident Prevention Organization

In our company, the problem of accident prevention is handled by a general committee of executives. This committee has associated with it a group of nine additional men, each assigned to a special problem. These are as follows: 1, platform hoists, concrete hoists, spouting equipment; 2, guarding machines, gears, belts,

saws, etc.; 3, guarding openings (except for hoists), ladders, and scaffolds; 4, derricks; 5, erecting and stripping forms; 6, plant and tools; 7, fire prevention; 8, bulletins, etc.; 9, records and statistics.

The general committee has appointed an executive committee of five to operate the plan under conditions established by the general committee. All members of the executive committee are in the home office and three of the members have occupied the position of general superintendent.

The first action of the committee was to institute a statistical system in accordance with the standards adopted by the Construction Section of the National Safety Council. These standards are described in Bulletin No. 21 issued by the National Safety Council but, as the collection of accident statistics has an important bearing on the study of accident prevention and as reference will be made to the terms "frequency" and "severity," it will be well to explain these terms.

Accident statistics are collected to give information on three important questions: 1, With what frequency are accidents occurring? 2, How serious is the accident experience? 3, What

causes the accidents to happen?

Frequency of Accidents

The frequency with which accidents are occurring on any job for any period of time is measured by the "Frequency Rate." The Accident Frequency Rate is the number of accidents resulting in lost time beyond the day or shift on which the accident happens, per 1,000,000 man-hours worked. In computing the frequency rate, an accident is not counted if the injured man is in shape to return to work the next day. If every accident was included, you can see that there would be a possible tendency for contract organizations to omit the filing of accident reports covering minor abrasions, etc., and it is very important that an accident report shall be made out for every injury, no matter how trivial.

The average frequency rate for thirty-six contractors reporting to the Construction Section of the National Safety Council for the year 1925 was 69.5. The lowest rate of an individual contractor was 10.3 and the highest 125.

Severity of Accidents

The true measure of the accident experience of a contract is the "Accident Severity Rate," which is the number of days lost per 1,000 manhours worked. Where the injured man recovers without partial permanent disability, the lost time is the actual number of days he is kept from working. In cases of death, permanent total disability or permanent partial disability, the lost time is taken from a table adopted by the National Safety Council; for example, death or permanent total disability is counted as 6,000 days, loss of leg above the knee 4,500 days, loss of one finger 300 days, etc. The twenty-three contractors who reported to the National Safety Council for the year 1924 had an average severity rate of 4.6 days lost for each 1,000 man-hours worked.

I would like to emphasize to each construction company the great importance of collecting and tabulating the information necessary for these statistics. Once each year the Construction Section of the National Safety Council publishes the records of all the companies reporting to it, but each company reporting is given a confidential key number so that the names of the companies are not used in the tabulation. The company keeping similar statistics is enabled to compare its experience with the experiences of other contractors.

Causes of Accidents

The third important main division of accident statistics is the study of the causes of accidents. The National Safety Council has adopted a standard classification of accidents, but it is usually necessary for each company to adopt additional subdivisions of each general subclassification. For example, our Committee not only was interested in knowing that falls from all kinds of scaffolds and ladders are the most serious cause of accidents, but also wanted to know how many accidents were caused by swinging scaffolds, how many were due to the use of built-up scaffolds, etc.

Our Committee collected the reports describing the 72 serious accidents on a list of contracts executed in the years 1919 to 1925 involving an employment of 43,000,000 manhours, equivalent to a force of 18,000 men working full time for a year. We then analyzed this group of accidents and drew the general conclusion that our accidents may be divided

into three general classes.

In Class A we judged that 20 per cent of all the serious injuries studied were due to accidents where the responsibility for the accident fell in greater part on us, as employers, through our failure to provide the safest practicable equipment and method for performing the work. Two accidents were reported caused by defective equipment. In Class B we judged that 20 per cent of the serious injuries studied were primarily due to thoughtless behavior on the part of a workman, sometimes amounting to gross carelessness. In Class C we judged that the remaining 60 per cent of the serious injuries studied involved less responsibility on the part of both the employer and the workman.

Our Committee thus reached the conclusion that two lines of effort were required. First, the study of equipment and methods in an attempt to reduce the number of accidents in Class A; and second, an earnest effort to educate foremen and workmen to realize the results of carelessness and thus reduce the accidents in Class B. It was felt that the best way to reduce the accidents in Class C was to work on Classes A and B.

Since the study of equipment and methods is primarily a problem in management, the Committee selects questions connected with equipment and methods which seem to it to be of the more pressing importance. Each of these subjects is referred to the member of the Committee who has been assigned to a special study of the class of accident which includes the subject to be studied. It is his duty to draw up a definite recommendation, which he submits to the Committee. To assist in this work, circular letters outlining the problem are sent to our superintendents to obtain their suggestions.

The education of superintendents, foremen and workmen to avoid unnecessary risks requires much thought and effort, and it is worth the thought and effort because those best qualified to express an opinion feel that more serious accidents can be prevented by such education than in any other way. Many methods have been used. Those which seem to us to have the greater value of application to construction work are as follows:

I. Shortly after the first of each month we send each superintendent a statement of the frequency rate for the preceding month on all of our contracts, together with the cumulative frequency rate from the beginning of each contract. With the frequency rate we send a description of all serious accidents which have happened during the preceding month. We ask the superintendents for suggestions to help in preventing similar accidents.

After every injury we require the superintendent to file with the committee a full report accompanied by sketches, describing exactly what happened, why it happened, and suggesting any practical method for preventing the recurrence of a similar accident.

We publish special articles on prevention in our magazine, which goes to all superintendents and foremen.

4. We put a simple first-aid kit on each job and make a special effort to see that every scratch is immediately treated with iodine.

We put up a bulletin board on each contract and post selected bulletins, issued by the National Safety Council, changing the bulletins every one or two weeks.

6. We post the customary warning signs.

7. We are trying to work up a series of cards somewhat larger than a pay envelope to be given at intervals to the workmen, carrying a brief statement of the results of some careless act, etc.

8. The holding of evening meetings of super-

intendents and foremen to discuss accident prevention is a great help.

Safety Hints on Cutting Concrete

PROTECTION of workmen engaged in the cutting of concrete with bull points and sledge hammers is an important item requiring special attention.

Many accidents occur in this line of work caused by flying particles, glancing blows of the hammer, loose



Showing the proper way to hold bull points

hammer heads, etc. One way to properly hold bull points is illustrated in the photograph above. Through a piece of discarded 1½ inch steam hose about 3 feet long a small hole is cut three or four inches from one end. The bull point is then driven through this hole so that the piece of hose forms a firm yet flexible handle for the point. When a bull point is held in this manner the man holding it receives no injury from glancing blows and is not liable to have his fingers pinched between the concrete and the bull point if it becomes wedged.

To prevent flying particles from

To prevent flying particles from entering the eyes, goggles should be worn by the man holding the bull point. The heads of all points and chisels should be properly dressed down at the time they are sharpened, and all burrs formed by the

hammer removed.

Hammer handles should be securedly wedged in place and never used unless they are in first class condition. An inspection of all cutting tools at intervals and the prompt replacing of those which are worn out is an important safety requirement.

ACKNOWLEDGMENT.—From a paper read before the New York Section of the American Society of Civil Engineers.

A COLUMN CLIPPED FROM THE



PULL GAUGE RAILROAD CARRYING PIT MATERIAL TO TRACK HOPPER

The Sand and Gravel Plant of the Ontario Supply and Transport Company

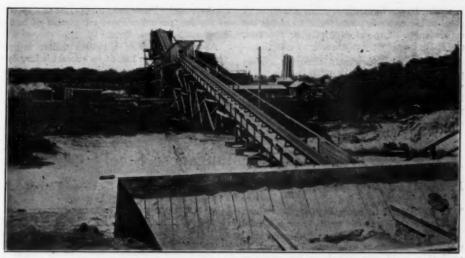
Interesting Development in Sarnia, Ont., Financed with American Capital

THE Ontario Supply and Transport Co., Sarnia, Ont., was organized by Detroit interests for the purpose of securing sand and gravel for building and construction purposes mainly for the city of Detroit. About three hundred acres of land containing suitable building sand and gravel to a depth of about 35 feet, running relatively 40 and 60 per cenc, were purchased near the south shore of Lake Huron. The material is shipped by vessel down the St. Clair River to Detroit and other places where needed. A dock has been extended 1,300

feet out into the lake capable of receiving boats of about 3,000 tons net. The company, however, is preparing to do some dredging so as to admit larger vessels. The problem has been to provide a dock running out into the lake, sufficiently strong to resist the northwest gales, especially in winter when hundreds of thousands of tons of continuous or floating ice press and beat against the shore. Thus far no material difficulty has been encountered. The dock consists of driven piles filled in with 20,000 tons of concrete and rock. It has withstood the



GENERAL VIEW OF SCREENS AND STORAGE TRESTLE



TRACK HOPPER AND BELT CONVEYOR TO WASHING PLANT

tempest thus far and will doubtless grow more durable with time.

Equipment and Operation

Eighty per cent of the machinery and equipment of the plant has been purchased from the United States. The material is dug by two electrically operated Marion draglines and loaded into air dump-cars and taken by locomotive to the receiving hopper. From here it is taken by belt feeders and deposited on a belt-conveyor, which is 30 inches wide and 375 feet long, operating at a speed of 500 feet per minute. The belt deposits the material into the plant hopper. From the

hopper it is drawn onto another set of belt-feeders and deposited into two cylindrical screens, 60 inches by 32 feet, where water is applied and the material washed, graded, and deposited into bins according to the size of the material. One of these bins is for "flat" or very fine pure sand; one for sand up to 1/4-inch; one for sand up to 1/4-inch; one for gravel of I x 21/2 inches; and one for oversize, or material from 21/2 inches up. The material is drawn from these bins by a series of gates placed in a concrete tunnel directly over a 30-inch belt-conveyor running at 550 feet per minute, which conveys the material to the storage pile. Then the material

LOADING
SHUTTLE
FOR DELIVERY
OF
MATERIAL
TO
VESSELS
AT THE
DOCK



is again drawn from the storage pile through gates in the concrete tunnel, which extends the entire length of the storage pile, or 650 feet, and has a capacity of 30,000 tons of material.

The material when drawn from the storage pile is handled by a series of 36-inch belt-conveyors measuring 750, 960, 712, 650 and 361 feet in length, and conveyed onto a shuttle-conveyor at the end of the dock, which is capable of depositing the material at any given spot

on the vessel. These belts all operate at a speed of 750 feet per minute and are capable of handling 1,200 tons per hour.

About a quarter of a million dollars is invested in this plant but, as its success is largely bound up with construction activity on the American side, it is affected but little by local prosperity.

ACKNOWLEDGMENT.—We are indebted to Fred C. Slater, American Consul, Sarnia, Ont., for the data on which this article is based and for the illustrations.

How to Weld Manganese Steel

Preheating and Heat Treatment After Welding Are Necessary for Work on This Metal

the subject of much research and experimental work by engineers and metallurgists, whose endeavor has been to produce a weld that will have the ordinary wearing qualities of manganese steel, and also to avoid an intermediate zone between weld and casting whose excellent properties are diminished. This alloy, in use, has the important property of resisting wear, particularly when used under conditions where the metal is subject to shock, which develops real wear-resistance to the highest degree.

Manganese steel contains about 12 to 16 per cent of the metal manganese and from 1 to 1½ per cent carbon. There are other minor metallic constituents also, in about the same proportions as in ordinary carbon steel, but these are relatively unimportant in their effect on the properties of the metal, and they do not affect welding in any way.

Manganese steel as originally cast must be heat-treated to develop its desirable properties. This heat treatment consists of raising the metal to a correct temperature, maintaining this temperature for a sufficient period of time, and then quenching the metal in water. When properly heat-treated, manganese steel is so hard that, while it can be dented slightly with a peen hammer, it cannot be cut or machined except by grinding.

The fact that some of the desired properties of this metal are the result of heat treatment makes the welding problem a difficult one. Added to this is the fact that the high temperatures involved in welding also tend to change the chemical and physical nature of the metal slightly. While a second heat treatment will restore the original properties in the main casting, it is sometimes difficult to correct structural changes in the narrow zone at the juncture of the weld metal and base metal.

MANGANESE STEEL WELDING TABLE Ozweld Type W-1 Prest-O-Weld Type W-101

Thickness of Steel, In.	Welding Head	Oxygen Pressure Lb. Per Sq. In.	Tip Size	Oxygen Pressure Lb. Per Sq. In.	Acetylene Pressure Lb. Per Sq. In.
15	7 .	14 16	7 8	3 3	2
1 and over	10 12 15	21 25 30	10 11 12	6	6 10

While it is considered that the welding of manganese steel is not yet fully developed, and while experimental work is still being done on this metal, certain practices have given satisfactory results. It is obvious that smaller castings will respond more satisfactorily to welding and subsequent heat treatment under ordinary shop conditions than larger and bulkier castings, because it is easier to heat uniformly and quench rapidly the smaller castings than those of greater bulk.

To prepare a casting for welding, the edges should be beveled to a 90-degree total vec. This work can be done only by grinding or by cutting with the oxyacetylene blowpipe. If the latter method is used, it is recommended that the edges be ground or pickled to remove

adhering oxide.

Welding should be preceded by preheating, handled in about the same way as ordinary cast iron. Larger castings should be heated slowly in a charcoal-fired preheating furnace made of bricks, while for small castings a kerosene preheating burner or even the welding blowpipe can be used. Manganese steel is quite brittle when red hot, so castings should be carefully supported during preheating and welding. Castings should be welded in the preheating furnace and protected from drafts or sudden chilling while hot.

Special manganese steel welding-rods should be used. These are procurable from the larger manufacturers of welding supplies. The blowpipe flame should be adjusted to show a slight excess of acetylene. Some very satisfactory work has been carried on with an excess acetylene flame showing an excess cone about three

times as long as the inner cone.

It is essential that a comparatively large tip or welding head be used, and that a large pool of melted metal be maintained at all times. The welding-rod must not be rubbed in the weld but must be held under the surface of the molten pool and the flame applied to melt the rod in the pool of molten metal. When the level of the pool is high enough, the rod can be melted into the base metal by directing the flame around the edges until the weld metal and the base metal flow together through their own fluidity. Avoid, however, getting such a big pool that it spills over on solid metal, because this makes an "adhesion" with no bond.

After welding is completed, the entire casting should be reheated to a bright yellow-red, or about 1,250 degrees F., maintained at this temperature for about 30 minutes, and then quenched in tepid water. It has been found that by far the best results are obtained by dropping the entire casting in a large vessel of water. It is not sufficient simply to pour water on the heated metal.

A sound weld made under these conditions will give satisfactory results where an unusual amount of strength in the welded part is not required. It has been mentioned that at the present stage in the development of welding technique for manganese steel there is a zone of weakness between the weld metal and base metal which does not respond readily to heat treatment after the weld is completed. Sound welds, however, should be entirely satisfactory from the standpoint of shock and wear, which, as a matter of fact, is the prime reason for using this alloy.

Acknowledgment.—From a copyrighted article in Oxy-Acetylene Tips, by permission.

How San Francisco Solved Its Labor Problem

Union Dominance Done Away with by the New "American Plan"

ROBERT T. SMALL, in a copyrighted article appearing in the New York Sun, reports that San Francisco, once entirely under the dictatorship of the trade union, today operates almost wholly under the "American plan" of employment. Union and non-union men work side by side on the vast building operations. The old grip of the labor leader has been broken apparently for all time.

In its new-found freedom, San Francisco is practicing no reprisals on union labor. Industrial and building programs are under the direction of an industrial commission and a wage labor board, which seeks to protect the employee and the employer alike, with the idea of serving first of all the general public in-

terests.

Irresponsible employers are not permitted to exploit non-union labor. A wage scale has been fixed which applies alike to union and nonunion artisans, and for virtually the first time in history San Francisco has a reign of labor peace instead of a reign of terror. The last of the great strikes, the last of those outbreaks of reckless outlawry, was beaten down last year when the carpenters, refusing to accept the award of the impartial wage commission, made their last stand. This strike was marked by extreme violence. Two carpenters are now on trial for murder in connection with the strike, and nearly a score of others are under indictment. Illegal picketing, slugging and murder were all a part of the disorder.

Ninety Per Cent Under New Plan

San Francisco is 90 per cent under the American plan as established and enforced by the Industrial Association, an organization with something like 15,000 members. Just what the American plan is explained by H. B. Allen, President of the San Francisco Real Estate Board and Secretary of the Industrial Association.

"The American plan as enforced in San Francisco," says Mr. Allen, "is something distinct and different from the old time so-called open shop. The American plan is predicated upon the proposition that the public interest is paramount to that of any community element and that neither labor nor capital nor any other faction or class should be allowed to take action that would jeopardize that interest. The American plan says to labor:

"'You cannot be allowed to secure an autocratic, selfish and restrictive control over industry, for the result is that not only the industry itself, but the whole public, is seriously

injured thereby.'

"The American plan says to the employer:
"You cannot be permitted to keep down labor, for when labor receives less than that to which it is justly entitled, not only labor, but the whole public, suffers seriously and is permanently injured—and we will not give you such unlimited backing that you can enter into combinations with your competitors and get a monopolistic control in your industry under

cover of community-wide organization.'

"Then, turning again to labor, the Ameri-

can plan says:

"'You are entitled to an equitable wage, to reasonable hours and to decent working conditions, but in turn you must be willing to give your employers honest, loyal and efficient service.'

"And turning once more to the employer, the

plan says

"'You have the right to demand honest, loyal and efficient service from all your employees. You are entitled to the right of hiring and discharging employees individually on merit without outside interference so long as on all occasions that right is exercised only on the broad principles of justice and to the right of rewarding the individual merit in employees, but in turn you must recognize the obligation of the management to the employees generally and particularly to cooperate in providing as far as possible continuous employment.'

System Is Workable

"Roughly and briefly, this is the American plan as established and enforced in the building industry of San Francisco by the Industrial Association. Theoretically fair, it stands proved as practically fair as well. It has freed labor from the self-imposed, but misconceived, restraint of selfish leadership, has emancipated employees from the throttling control of labor unions and has guaranteed to the public, to labor and to the employer, that all legitimate

rights will be protected at all times."

While San Francisco had a law and order campaign as far back as 1916 during a serious strike on the waterfront, it really was not until 1921 that the city became aroused and determined to throw off the shackles of union labor. At that time the building trades refused to accept an award by the wage commission and a general strike was obtained. The Chamber of Commerce raised something like \$1,200,000 to win this strike and to establish the Industrial Association. The general strike lasted about five months, and then capitulations began.

But, for many years prior to 1921, San Francisco was notorious as a hot-bed of trade union activity and generally was considered one of the best organized and tightest communities in the United States in all lines of industry. The general strike of that year presented for the first time possibly in the history of the city, a clear-cut moral issue related to the labor problem, and the entire community was aroused. Although there had been innumerable protests against the union's dominant position, never before had all interests been unified in their conclusions to so organize their affairs that the condition they thus faced could never occur again.

In bringing about the new order, it has been necessary not only to exert a strong hand in regard to union activity, but also to bring pressure to bear on employers who have attempted to take advantage of existing conditions and create unjust wages or working conditions.

Purchasing the Service of Executives and Machines

WHEN a new executive proves himself capable of handling successfully and with profit to his company, a job that is extraordinarily difficult, his employers are not likely to quibble long with him over the matter of his salary. And that salary goes on month after month, year after year, as long as results are coming in and the man remains on the job. If he is paid a big salary at the start, that salary will probably get bigger, not smaller, as time goes on. The cost of his upkeep to his employers steadily increases.

If it is a machine instead of a man that is being "bought"—a crane, gas shovel, hoist, concrete mixer, or tractor and tractor-drawn equipment—then the first cost, if the machine is a good one and well adapted to its work, is the one and only big cost. All other expenses for the machine should prove

mere incidental upkeep.

The machine, like the man, will go on with its work, month after month, year after year, yet the machine asks no increases in pay. The contractor bought it and he owns it. The builder of the machine does not come around to the contractor after a period of years and say, "You have long since gotten your money's worth out of this machine. Now you must buy it from me again—and at a higher price."

So, in buying a machine, the first important thing is to get one that is well adapted to the work in hand. The second important point is to get one that will give extra years of service beyond the time for which you have within reason paid. And the responsibility of seeing that the contractor gets both the adaptability and extra length of service is a part of the duty of the seller, the house, and the distributor from whom he buys.

If you are skilled in the knowledge of machines and equipment and their uses, then you perhaps feel safe in your own judgment, but regardless of the extent of your own experience and knowledge in this line, you should be able also to bank on the ability and integrity of the distributor from whom

you buy.

Selling machines that deliver, is, at the most, incidental to selling methods, performance and profit. You can buy machines in the open market anywhere. There is always an eager hand stretching to take your order, but to get the plan, the method, and the service, all in the machine that is well adapted to your work, it is well to look beyond price. First cost may obstruct the vision of future and long-time profits.

ACKNOWLEDGMENT.—From Tackie Tales, published by the Beckwith Machinery Company, Pittsburgh, Pa.

Constructing a Gravel Washing Plant for Truck Service

By FRED W. CORNUELLE Red Bank Gravel Company

ROM a number of years of experience in the gravel business in Cincinnati and the immediate vicinity, both in the building of plants for either rail or truck service, I find the construction of a trucking plant should be somewhat different from a plant built for car load shipments.

In the building of a gravel plant for truck service, there are several very important items in construction to consider which are of major importance for the successful operation of such

a plant.

Large bins or storage capacity for a truck service plant is of vital importance, and money expended for this purpose will lend more to a this nature are more easily met.

The building of two similar plants with duplicate machinery for each plant has proved to be a very successful method of combating such problems. There is, however, a saving in labor in the building of the larger unit over the operating expense of two plants.

A plant built with ample storage affords the operator a chance to serve the trade on the peakload days. He may also find time to make a few minor repairs, provided the plant is backed up with large storage, and still maintain his regular service.

The sale of sand and gravel in many instances is a one-day transaction, and the plant with a

DELIVERING
SAND AND GRAVEL
FROM
THE RED BANK
GRAVEL
COMPANY'S
PLANT
ON A WINTER
MORNING



successful operating plant than any other one item.

Deliveries made from a plant of this nature, and the requirements for sand and gravel called for at the plant are irregular—especially when sales are to retail and wholesale customers—and such a plant must of necessity be built to serve a flexible demand.

Plant Capacity Necessary

In our own operations we have experienced a variable requirement which fluctuates from about two hundred tons one day to over a thousand the following day, causing us quite a bit of anxiety in the maintenance of service. With sufficient storage tipples, requirements of

small bin capacity, on days when the demands are greater than the plant's operating ability, must either refuse business so offered or run short of material. This act, in the minds of the contractors today, constitutes an unpardonable sin, and ultimately causes a loss of trade.

The building of a washing plant with ample storage capacity enables the plant owner to operate on days when the demand for gravel is below normal, and also allows for an even distribution of the employees.

A plant so designed can operate without interruption on the bad days, when the weather would not permit laborers to work out in the open. The yard and truck work can then be done when the weather will permit, provided, of course, there is sufficient storage of sand and gravel in the hoppers.

We have found from past experience that for one and possibly two days in each week we will have a sale for sand and gravel greater than the rated operating capacity of our machinery. With a large enough bin capacity we are able to care for such requirement, and are in position to sell our operating output plus whatever bin capacity we may have. In other words, large storage is the solution to a more uniform delivery and operation.

The question may now arise as to what constitutes the correct size of a trucking plant. My answer would be that a truck service plant should be so designed that the operating capacity will be equal to what may be the peak-day demand; and the storage capacity should be equivalent to double the operating capacity.

High Water Content Objectionable

The water content in sand and gravel when delivered direct from a washing plant is the cause of much complaint and criticism from the consignee. Water dripping from trucks delivering sand and gravel often leaves the roads leading from a washing plant wet and unsightly. In some localities laws have been enacted prohibiting the carrying of sand in a wet condition.

Sand and gravel delivered on the job wet causes the contractor quite a bit of inconvenience on account of the condition of the yard storage space. Wherever such material is dumped there is always a loss when it is to be

reclaimed.

The brick and plaster contractors prefer sand delivered in a semi-dry state, so that they can mix the lime or patent mortar with the sand dry before adding water. A number of the mason contractors will not receive wet sand at all.

Making an allowance for water content for materials delivered in a wet condition is only fairly satisfactory. In the first place the consignee is more or less skeptical and rarely ever does he believe that a certain percentage has been deducted from his invoice for water. In the second place if the shipper does deduct for water, he is forced to haul a tonnage for which he receives no pay. This will amount to several thousand dollars in a year of fairly good tonnage.

There are today several types of de-watering apparatus on the market, but none as yet that will take wet sand direct from a washer and reduce the water content so that it is entirely satisfactory to the trade.

Although we have used a de-watering machine for several years, we find the best solution for draining sand is in the use of duplicate bins for the same class of material. By this method we are able to serve sand and gravel from bins where the material has been stored at least twelve hours and sometimes a day before it becomes necessary to draw it out. This allows the water to drain out, and saves the expense of making a large water allowance.

Gravel Washing

The source of water-supply is very important when washing gravel in freezing weather. Water taken from a river or small stream when the outside temperature is at freezing point or below will be near the freezing point, whereas water taken from a cased-in well will register no less than 50 degrees Fahrenheit. Sand and gravel washed with water at this degree of temperature will pass into the bins at a much higher temperature than gravel washed with river water.

Gravel so washed will retain a temperature above freezing in the bins for quite a long time, depending upon the size of the bins, and can be delivered free from frost.

Bin and Tipple Construction

The width of the runs under the tipples of a trucking plant is entitled to some consideration. A runway built too narrow will cause the trucks to bump the sides of the walls and a loss of time in loading; on the other hand, where a driveway is wider than necessary, the drivers are inclined to become careless in spotting their trucks for loading, with the result that the equipment is very often loaded to one side. We have found that a driveway about 9½ feet in width answers the purpose very well:

Batch deliveries of sand and gravel today necessitate the building of tipples with more head-room. Although the average truck, including the cab, is not much over 8 feet-high, it is necessary to build the floor of the tipple about 14 feet high to permit the use of batchers.

Washing plants can either be built of wood, concrete, or steel, and although concrete is preferable for permanent construction, a bin so designed will hold water longer than a wooden structure and will not drain as readily.

Where wood is used, the floor of the bins and the sidewalls for the runways and support of the tipple should be concrete. If this is done the runways at either end can be housed in, and the bin gates kept from freezing for winter operation by the use of salamanders.

The type of wooden bin construction commonly used is built by standing a certain size of studding upright, nailing the sheathing to the inside, and placing girdles, tied together with rods running through to either side of the tipple, around the outside. This makes a very rigid tipple, but on account of the horizontal position of the sheathing boards, and the numerous angles for water, it will rot in a short time, and it is also difficult to repair.

The silo type of wood construction, although somewhat more difficult to build, makes a more permanent tipple. It will not rot nearly so quickly, takes less lumber in building, and saves several square feet of floor space of the outer area of the building.

A tipple should be built square or nearly so wherever it is possible. This is preferable to the oblong type of construction. There is a saving in the amount of material used, it allows for more than one runway under the tipples, and also provides better floor space on the top floors to place the machinery.

Machinery and Power

The machinery in any washing plant should be simple, with as few chutes as possible to do the work required. Ample floor space around each screen is very necessary. Cramped placing of machinery is frequently the cause of insufficient oiling. It also retards making repairs when screens are placed too close to each other.

Where electric power is available, an individual motor for each unit is advisable. The motor should be larger than the rated horsepower of the machine to be driven, to insure steady power with few breakdowns.

In a plant recently completed we installed a separate motor for each machine. The motors operate through a speed reducer. Thus we are able to eliminate all belt, spur-gears and chain drives. The speed reducers were placed on trial and proved to be a success.

On account of the oversize gravel in many deposits, the installation of crushers is essential. There is a difference of opinion as to the location of crushers relative to the balance of the screening machinery. In some plants the crushers are placed up in the building, while in others they are placed on the ground level. When placed in the plant so that the oversize may be fed direct to the crushers from the grizzle screen, there is a saving in re-elevating the crushed product, but the stone is generally wet and more difficult to screen. The crushers take up valuable space in the plant, and it is impossible to provide storage space for the uncrushed oversize in case of breakdown of the crushers.

Placing crushers on the ground floor allows room for the uncrushed oversize. The stone will drain in a storage bin and will crush and screen more readily. With a storage for the uncrushed oversize, the operation of washing is independent of the crushers, insuring a more uniform process.

ACKNOWLEDGMENT.—From an address delivered at the Eleventh Annual Convention of the National Sand and Gravel Association.

Latest Developments in Simplification of Sizes and Styles of Paving Brick

TAKING cognizance of an increase in shipments of 2½-inch paving brick from 31,802,533 in 1925 to 58,468,007 in 1926, the Permanent Committee on Simplification of Variety and Standards for Vitrified Paving Brick, of the Department of Commerce of the United States at its meeting in Washington, March 31, reinstated this size in the list of recognized types and sizes of paving brick.

The revised list of recognized types and sizes of vitrified paving brick as determined by the committee and the percentage of total shipments represented by each size is as follows:

REPRESSED LUG BRICK 4 inches x 3½ inches x 8½ inches.... 14.5 per cent

WIRE-CUT LUG BRICK
4 inches x 3½ inches x 8½ inches.... 6.4 per cent
79.1 " "

Note: Remainder of 20.9 per cent made up of special sizes or types not included in recognized list.

The survey of the industry, made each year by the Department of Commerce to serve as a basis on which the simplification committee may make its annual decisions, has revealed a big increase in total shipments of paying brick for 1926 over 1925.

Total shipments for 1925 were 353,588,777. Those for 1926 were 413,125,469, or a gain of 59,536,692 for last year.

The 2½-inch brick was the only size showing a notable gain in percentage of total shipments, representing 8.9 per cent in 1925 and 14.1 per cent in 1926.

It will be remembered that the paving brick industry was the first industry in the United States to cooperate with the Department of Commerce in its movement to reduce waste in industry by eliminating excess sizes and varieties. The first simplification conference held in 1921 eliminated 55 of 66 types and sizes then existing. Among these was the 2½-inch brick which has just been reinstated.

This reinstatement of a size once eliminated is pointed to by the Department of Commerce as evidence of the fact that "simplification" and "standardization" are not synonymous. The groundless

fear in some industries that simplification means standardization and hence may retard or curtail progress and the development of new ideas through research and experiment, has hindered the simplification movement and has kept some industries from cooperating wholeheartedly in this endeavor. Thus it remained for the industry that had pioneered in the simplification movement to demonstrate in the seventh year of its waste-reducing effort that simplification is a flexible instrument and not the rigid standardization so repulsive to American individuality.

The Permanent Committee on paving brick simplification is composed of the following members: P. H. Bates, Bureau of Standards, Washington, D. C.; Edward E. Duff, Jr., Secretary Na-

tional Paving Brick Manufacturers Association, Cleveland, Ohio; R. Keith Compton, American Society of Civil Engineers, Richmond, Virginia; Geo. F. Fisk, American Society for Municipal Improvements, Buffalo, N. Y.; R. M. Hudson, Chief, Division of Simplified Practice, Department of Commerce, Washington, D. C.; T. R. Lawson, American Society for Testing Materials, Troy, N. Y.; E. W. McCullough, Chamber of Commerce of the United States, Washington, D. C.; E. J. Mehren, Chairman, McGraw-Hill Company, New York; O. W. Renkert, American Ceramic Society, Canton, Ohio; George F. Schlesinger, American Association of State Highway Officials, Columbus, Ohio; and P. St. J. Wilson, Bureau of Public Roads, Department of Agriculture, Washington, D. C.

The Five-Day Work Week-to Be or Not to Be?

William Green and O. W. Rosenthal Discuss Opposing Angles at Meetings of the New York Building Congress

NE of the most interesting features of the series of winter meetings of the New York Building Congress, held in the Commodore Hotel, New York, was the discussion of the merits and demerits of the five-day work week—a discussion led on the one hand by William Green, President of the American Federation of Labor, and on the other by O. W. Rosenthal, of the O. W. Rosenthal-Cornell Co., President of the Builders' Association of Chicago, and Vice-President of the National Associated Building Trades.

Mr. Green, who spoke at the first meeting, claimed that the advocacy of the five-day work week on the part of the American Federation of Labor was based upon two fundamental reasons, one economic and the other humanitarian. It was admitted that it was possible that all lines of industry are not ready immediately to accept and put into practice the principle of the shorter work week, but that there are many lines of industry which could now operate, and are operating, successfully on the shorter work week basis. "It has been tried and tested and found to be economically sound."

Dealing first with the economic side of the question, the speaker pointed out that the capacity to produce manufactured articles has increased to the point where continued serious thought must be given to an equalization of producing and consuming power, and recognition given to the necessity of balancing the facilities of production with the capacity to buy and use the things produced. Certain industries, some of them basic, are governed by seasonal fluctuations, and, because of their great productive ability, are unable to operate steadily. In all such industries where part time operation is inevitable, the substitution of a

shorter work week would distribute the working time over a larger period, and as a result, overhead charges could be reduced; improved, scientific methods of production could be employed; wasteful processes could be eliminated; labor turnover could be reduced, and a more efficient organization could be maintained.

There has been a tremendous increase in industrial efficiency of late years, due to the increasing use of mechanical equipment and the development of the efficiency and productivity of the individual workers, and further progress and further economies through the use of improved machinery and improved methods is predicted. The general substitution of the shorter work week is bound to follow such economic developments. The same underlying causes which brought about the general acceptance of the eight-hour day will operate just as effectively in bringing about the acceptance of the five-day week.

"It has been charged by some influential manufacturers that the shorter week will tend to increase the cost of manufactured articles," said Mr. Green, "and that such increased cost will burden the consuming public and greatly handicap American industries in foreign markets. Labor denies this charge, and in reply asserts in most positive terms that the establishment of the shorter work week can be brought about without adding to the cost of manufactured commodities. Under the stimulating influence of the economic and social benefits resulting from the establishment of the short work week management, the workers will develop plans and methods which will result in expanding productivity so that the cost of manufactured articles will be reduced instead of increased."

The allegation that a loss of the country's foreign trade would follow the inauguration of the shorter work week was denied, advancing as argument the fact that foreign countries are sending commissions to the United States for the purpose of finding the basis of its industrial supremacy and superiority.

Turning from the economic to the humanitarian side of the question, it was claimed that the shorter work week would help to provide working men and women with the opportunities for further intellectual, artistic and spiritual development. "It is the humanitarian reason which makes the strongest appeal to our conscience. The opportunity to live a more complete life and to experience surcease of exacting toil would be a boon to the human race. No industrial reform would be more welcome or acceptable to working men and women than the universal inauguration of the shorter work week. In all our industrial planning we must consider the spiritual and cultural welfare of mankind. We must emphasize these intangible human values which raise men and women to a higher plane of living. The exhausting effect of long periods of human labor can be overcome only by rest. Five consecutive days of constant toil make a heavy demand upon the strength and vitality of the workers. The extended period of rest accorded the workers through the adoption of the shorter work week would enable them to face their weekly tasks with increased strength and vigor. There is no doubt that the workers would, within a short space of time following the change, be performing as much service during the five-day period as they formerly did during the 51/2- and 6-day work week.

"It is not possible to comprehend the benefits and advantages which would come to the industry, the working people, and the public through the inauguration of a shorter work week. Physical and spiritual values would be enhanced, our standards of living would be raised, family and home life would be made increasingly pleasant, and a spirit of satisfaction would prevail in the minds of the workers."

This side of the discussion was closed on an optimistic note, expressing the belief that the advent of the shorter work week was already approaching, and that this generation would see it generally established in all lines of industry.

The Employer's Side

Mr. Rosenthal, in the opening passages of his address, stated that the five-day work week is not being seriously attempted in those communi-

ties that have an open-shop condition, but only in those communities wherein union labor has a complete monopoly. Collective bargaining, in his opinion, is a fact only where union labor's monopoly is not complete and in the community where it is complete, it becomes collective demand. The five-day week has never been presented in an orderly and fair spirit to those who are vitally affected by it.

It has never been taken up in an orderly way for discussion, and its background has never been properly disclosed. In his judgment, there could be but one purpose in the five-day week demand, and that is to create a labor shortage; thereby creating a greater demand, resulting in higher wages. He went further, and accused the Federation of Labor of forcing the new measure into effect in some communities by unfair means.

No attempt was made to discuss the practicability of the five-day week from the standpoint of any branch of industry other than that of building construction. Building construction, it was stated, while it has long ceased to be a seasonal industry, its business being carried on almost universally throughout the twelve months of the year because of new and improved methods, still is not an industry of machinery. "It is an industry which gives great opportunity for individual expression, and for the development of the soul of the man. It is an industry in which the individual effort is clearly seen, not only in the quantity, but in the quality of the work performed. It is an industry that cannot be put on a shift basis. Its work generally can be properly done only by daylight. It is only in extreme cases that the tremendous additional expense and hazards of night work can be permitted, and while it has become, generally speaking, a twelve months' business, it is affected by weather conditions more than any other industry. The days lost because of inclement weather are more than in all other industries.

The very nature of its operations on the public thoroughfares, its lack of storage space, its dependence upon the common carriers and trucking concerns to see that materials are delivered at the time required, the tremendous interest charges and loss of the use of space to owners should the operations be dragged out, demand that every working day and working hour be used.

"It may be possible in other industries to shorten the number of work days per week and add to the number of shifts per day, or add to the number of machines and thereby maintain the same output, with an increased overhead, but the man-power in building construction cannot be readjusted to meet this situation. That job which is economically and efficiently organized, has upon it, if they are available, the number of men required to do that work. To place more men upon the job than can efficiently operate is economic waste, and to have fewer men on the job than can properly, expeditiously and efficiently perform the work, is equally wasteful...

"Mr. Green assures us that the additional day of rest will bring the man back on the job, refreshed and willing to do a better day's work. This is quite contrary to the experience of those engaged in building construction. He assures us that labor will find the way, and devise means by which production will be so increased that the work now performed in forty-four hours can easily be performed in forty. When labor finds the way to produce forty-four hours' work in forty, there will be no occasion for asking labor to work forty-four hours to do forty hours' work, and no employer will be quite so foolhardy as to ask men to work forty-four hours to do forty hours' work.

"Whatever labor's purpose can be in demanding the five-day week in the construction industry, that purpose cannot be accomplished by securing the five-day week. It accomplishes nothing; it brings about reorganization and readjustments, and brings labor back ultimately to just where it started. The five-day week is not only bad economics; it is bad morals. It emphasizes the importance of leisure, rather than the importance of man's workman's opportunity to serve. It centers his mind on not working, rather than on producing. Why does labor demand in the building industry a shortening of the number of hours of work per week, when there is more work to do than labor is doing in five and a half days? Doesn't labor realize, doesn't labor know-and I think it does -that when labor will do its work in five days, in four and a half days, or in even less days, the employer will not ask them to work more days?"

The proposed inauguration of the five-day work week was referred to in the discussion as a move toward restriction, a restriction of the mass production that would result in higher prices, which again becomes an argument for higher wages. It was complained that labor had not waited until business had dropped off so that the work could be done in forty hours a week, but made its demands for a forty-hour week at a time when forty-four hours was insufficient on the basis of present production, or willingness to produce.

The five-day week, it was asserted, has not emanated from the rank and file, but is a political issue, dragged, like the street-car issue in many communities, from one campaign to another.

To quote the summing up, "In my opinion the whole thing is bunk, and I do not believe the public will be fooled by the protestations of those proponents of the five-day week who would have them believe that its purpose is to advance the spirituality of labor. Who ever heard of man's spiritual welfare being advanced by more leisure? Labor is going back to an old theory, not a new one; to the theory of the autocrat, that the man who works seventeen hours a day represents the lowest strata of society; the man who works twelve hours represents a higher strata; the man who works eight, a still higher strata, and he who works not at all, the highest.

"I confidently believe that the day will come, and I know not how soon, when there will be a reorganization of our entire system, and labor can well direct itself toward that end; toward the end that education, art and labor will be combined; that man will get his greatest pleasure in expressing himself in his work; that day when a man's work will be his art and his education and his pleasure. As said Carlyle; 'I do entirely agree with those old monks, laborare est orare-work is worship'; and, as Morris said, 'One day we shall win back art again to our daily labor, win back art-that is to say, pleasure of life to the people.' But that is not to be done by increasing leisure. That is to be done by arousing in man a desire to do better things. and to do things better."

Mayence Cathedral Piling Decays After Fall of Rhine Level

THE men who planned and constructed the historic Mayence Cathedral eight hundred years ago erected an enduring monument to their ability, and yet they overlooked one seemingly improbable contingency which has now arisen to imperil the cathedral, according to a United Press dispatch.

The piling driven when the cathedral was built

served perfectly as long as the Rhine River maintained the level recorded at date of construction. The falling of the river level, however, was a contingency for which the builders had not prepared. When this occurred, the soil surrounding the piles dried out and shrank, the piles decayed, and the piling failure is now being recorded in the appearance of cracks in the walls and arches.

The Use of 1-1/2-Yard Dump-Trailers on Road Grading

By W. McKEE Superintendent, Richards and Gaston, Inc., Somerville, N. J.

N two recent road-grading contracts awarded to Richards & Gaston, Inc., Somerville, N. J., Easton 1½-yard dumptrailers were used, with a substantial saving over both truck and horse-drawn wagon costs. The contracts covered grading part of the Yellow Frame Church Road, between Newton and Blairstown, N. J., started in April, 1926, and 11/3 miles of the Middleville, N. J., road started in the fall.

Hauling Conditions

The first contract, a 30-foot road, required a number of changes from the original line and

quicker than motor trucks or wagons.

The top of the trailer body is lower than that of either the motor trucks or dump-wagons used. This permits a lower lift on the dipper and consequently faster loading. When dumping, the body turns through slightly more than 90 degrees and empties completely without handscraping. When empty the body falls back into position as the tractor moves forward, aided to some extent by a spring. The body automatically locks on coming to an upright position and is held securely until a lever within reach of the operator's seat is tripped while unloading.

The trailers have proved their reliability by



DUMP TRAILERS BEING LOADED BY POWER SHOVEL

many difficulties were encountered. Stumps and large boulders had to be removed. Much of the digging was in hardpan, some cuts being 14 feet deep and fills from 14 to 17 feet. Hauls as long as ½-mile were occasionally required, where cuts did not balance fills. A gas-electric shovel with a 1-yard dipper was used in loading.

In the latter part of May, 1926, an Easton 1½-yard trailer and a Fordson tractor were put into service, on trial, and having proved satisfactory, three more units were purchased. The trailer was easily loaded to two cubic yards, the body being 4 feet, 9 inches long, 5 feet wide, and 2 feet, 6 inches deep. The steel wheels were 51½ inches in diameter and the over-all height of the body was 6 feet. The tractor-trailer can be placed in position for shovel loading much

low repair and maintenance costs under hard conditions of service. With the exception of a few bolts and clamps holding the body to the axle, no replacements have been required. Considering that large boulders, as well as a large daily yardage of earth, are handled, this record is very satisfactory.

Comparative Yardage of Trailers and Alternate Equipment

On days when the average haul was 1,000 feet, the Ford tractor trailer units hauled an average of 150 yards each in ten hours. This has been exceeded considerably when the shovel was working in deep bank and loading fast. Under similar conditions, a 5-ton motor truck handles 160 yards and a dump-wagon with a team hauls 60 yards.



TRAILER
IN THE ACT
OF
DUMPING ITS
LOAD

Comparative Hauling Costs

Table A gives the hauling cost for one trailer and tractor. Basing fixed charges on a life of only four years, depreciation, average interest at six per cent, and a liberal allowance for repairs and maintenance, make up an average fixed cost of 62 cents per day. Daily tractor costs amount to \$8.68, of which \$5.00 is for the driver's wagon. Thus the total tractor and trailer cost is \$9.30. With an average daily yardage of 150, the cost per yard for a 1,000-foot haul is 6.2 cents.

Table B shows hauling costs in a similar way for a 5-ton truck and for a wagon and team. The 5-ton truck costs \$20.96. With a daily average of 160 yards the cost per yard was 13.1 cents.

For the dump-wagon and team the daily hauling cost per yard was \$7.80 which, and with a daily yardage of 60, makes the cost per yard 13 cents. The savings effected by the trailers over both trucks and wagons are given in table A, the saving over trucks being 6.9 cents and over wagons 6.8 cents. An average day's work by the trailer and tractor on this job-150 yards hauled an average of 1,000 feet-shows a net saving of \$10.35 per day over the truck and \$10.20 per day over the wagon and team. Under these conditions, the trailer and tractor equipment will pay for itself in slightly over 90 days of use. Considering its short radius of turning, the ease of spotting, the quickness of dumping without the driver leaving his seat, the ability to negotiate rough ground at good speed, and the saving of over 50 per cent in cost per yard, we feel that the equipment has made a most satisfactory record for earth handling on these road grading contracts in northern New Jersey.

N		
TABLE A-HAULING COSTS WITH YARD TRAILER	H EASTO	N 134
Conditions: 1000-ft, hauls, 150 yds., per	10-hr. day	PR
Easton Trailer: Depreciation—\$430.00 + 4-year life *Average interest		
\$430.00 × .06/2	16.13	
Repair and maintenance allowance	25.00	
Total fixed cost per year	\$148.63	
Fordson Tractor		\$0.62
Depreciation \$525.00 + 4-year life	\$121.25	
\$525.00 × .06/2	19.09	
Perciation-\$525.00 + 4-year life *Average interest	125.00	
Total fixed cost per year		
Pixed cost per day-\$275.94 + 240		
Gasoline—12 gal.×\$0.19 Oil—½ gal. 8 \$0.5 Driver—10 hr. ×\$0.50	\$ 1.15	
Oil—1/2 gal. @ \$0.5	.25	
Cost per day	1	8.68
Hauling Cost: Per day Per yard—\$0.30 + 150 yards. Per day Per yard—\$0.30 + 150 yards. Saving over alternate costs: 5-ton truck (from following page). Wagon and team (from following page). Baston trailer Saving over 6-ton truck Per cent. saving Saving over wagon and team Saving over wagon and team Per cent. saving Daily saving on same yardage: Over 5-ton truck—\$0.009 × 150 yd Over wagon and team.—\$0.008 × 150 Allowing for interest earned by deprecia	\$ 0.131 \$ 0.130 0.062 \$ yd	0.069 0.068 10.35 10.20
TABLE B-HAULING COSTS WITH RQUIPMENT	ALTER	NATE
Conditions: 1000 ft. hauls—10-hr. day 160 yds, with 5-ton truck 60 yds, with wagon and tear		
i-ton trucki	n	
Depreciation—\$5500.00— (\$350.00 tires) + 4-yr. life	1287.50	
5/4 × \$5150.00 × .06/2	193.13	
Repair and maintenance allowance (in- cludes license and overhauling)		
Total fixed cost per year	1780.63	
Gasoline—30 gaia × \$0.19	7.42	
Gasoline—30 gais. × \$0.10. Cli—3/4 gai. ⊗ \$0.50. Tires—\$350.00 + 240 days. Driver—10-hr. × \$0.60.	.038	
Driver-10-hr. × \$0.60.	6.00	

Hauling cost: Per day	Cost pe days. Team:
Wagon and team:	
Wagon: Depreciation—\$200.00 ← 4- year life	Hauling of Per day Per yar
Total fixed cost per year \$ 72.00	Allowin

Cost per average day—\$72.50 + 240 days. Team: Depreciation, feed and shoeing \$ 2.50 Driver—10 hrs. × \$0.50 5.00	*	0.30
Cost per day		7.50
Per day		7.80 0.13

* Allowing for interest earned by depreciation reserve.

When Your Oils Thin Out

E all know that after engine oil has been used for a time it loses its body and we sometimes refer to the change as breaking down. Oil does not break down or undergo any permanent thinning out when it is heated.

A mixture of oil and gasoline is naturally thinner than new oil, and this is exactly the mixture that we have in the crankcase when the oil is said to have "thinned out." Unvaporized gasoline in the cylinders leaks past the pistons and mixes with the oil in the crankcase. Whenever there is an excess of liquid fuel in the cylinder this is bound to happen, according to G. S. Hamilton, Climax Engineering Co., Clinton, Iowa.

We know that new oil will separate the moving parts better than thinned oil, although the latter may give us fair lubrication under ideal conditions. To prevent engine wear we want to separate the moving parts far enough so that the particles of road dust and other abrasives that are carried in the oil film will not touch the metal surfaces and cut them. This road dust and abrasive material is drawn in with the air through the carburetor to an extent that varies with the operating conditions.

For the longest engine wear the oil should not be allowed to thin out too much and abrasives should not be allowed to accumulate. If oil is not changed at proper intervals—at least after every fifty hours of service, the abrasives under ordinary conditions will accumulate to an extent that will cause damage. Oil which is not used too long and which is kept reasonably warm is usually clean oil of proper body. With this protection the engine will give many times the service that would be possible otherwise.

The Gathering of the Clans



A MORNING SCENE AT THE YARDS OF FRANK N. GOBLE, INC., BUILDING CONSTRUCTORS, WHITE PLAINS, M. Y.

This picture, taken at the rear of the mill and offices at 49 Brookfield Street, White Plains, shows most of the hundred and more men who assemble daily, preparatory to going to the various jobs scattered throughout West-clester County and part of Connecticut. Included in the picture are 46 painters, 30 carpenters, 14 masons and plasterers, 19 laborers and the officers of the company, Wm. J. Gobbs, President; Charles F. Sanford, Vice-President; Thomas H. Cole, Treasurer; Mortimer Y. Pietschker, Secretary and Robert E. Powell, General Superintendent. The police are not ordinarily necessary

Current Business Conditions

Analyzing Current Data from the Standpoint of the Contractor

Edited by GEORGE E. MacILWAIN, Business Economist

Small Firms Being Tested

OLONEL LEONARD AYRES, of the Cleveland Trust Co., one of the keenest scrutinizers of business conditions in the country, comments on the large number of failures in 1927, as compared with 1926 and especially on the small assets of the great majority of the failing firms. The line of "number of failures" and the line of "average assets" make, when put onto the same chart for the years 1923-1927, a very good "X," with "number" going up and "assets" going down.

Ayres points out that this is what is happening. The conditions of the time are forcing smaller firms into bankruptcy, because they can not meet the efficiency, the research knowledge and the buying and selling skill of the large firms.

Mail which arrives on my desk as I write these words contains letters of the same tenor from the secretaries of several Trade Associations.

If the Contracting Business is now at its peak and is facing, as many believe, a period of diminishing activity, then the Contractors may reasonably expect to have this same failure condition, which now bothers other industries, strike them in the near future.

One of the best indications of wisdom is to let other peoples' troubles teach you. The entire building and contracting industry lags behind other industries, both as things go up and as they come down and the changes in other business thus become an advance notice to Contractors of what is coming to themselves.

Business Volume Lower

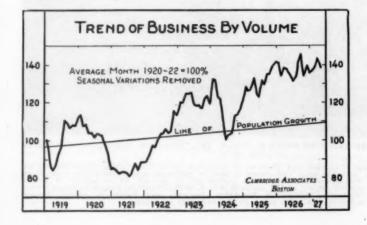
The Current chart on Business Volume shows a small drop from previous levels. This leaves the current level still high, but reflects the too rapid pace of the first four months of the year, which have piled up some accumulation of stocks. We are evidently in for a little more than the usual summer quietness in general business.

Carloadings, however, are running high, which indicates that distribution is going on at a rapid pace. This bodes well for the fall pick-up.

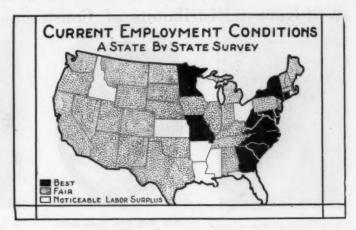
Employment Less

Employment is running at about 90, compared with 93 a year ago. This is a bit below normal, for we are accustomed to have about six or seven per cent of unemployment in good times. Contractors will find that wages will hold up, but that it will be easier to find help than it has been. The only places where this may not be so are the States where grains are being harvested.

The Employment Chart does not mean that the sections where there is the most idleness are necessarily bad places for the Contracting business. Buying power holds up in spite of



COMPOSITE LINE SHOWS SLIGHT DROP IN VOLUME OF BUSINESS EMPLOYMENT IS ONLY SLIGHTLY LESS THAN LAST YEAR AT THIS TIME



more idleness, and it is buying power that tells the story.

Guard Against Failure .

The probable difficulties of the small contractors referred to in the first paragraph, call for a remedy. I know of none more promising than is afforded in the work of a kindred industry. I refer to the Sand and Gravel Industry. During the last five years, under the lead of the National Sand and Gravel Association, this industry has been placed on a scientific basis. Guesswork has given place to facts and the aid of the best scientists has been called in to place the selection and preparation of aggregates on a proper basis. Mechanical devices have also been greatly improved.

The Sand and Gravel man, who has kept up with this work of his Association, is thus in a position to meet coming stringency. There is much in the work of the Sand and Gravel people that could be taken over bodily by Contractors. But the conditions of the times suggest that similar work should be done by Contractors in preparation for days when it may not be so easy to get work as it is to-day.

Public Works Promise Activity

I do not anticipate any great falling off in State and Municipal projects, until there is a marked falling off in business. Nothing but a sense of the need for economy will stop road and bridge building and so long as money is plenty, schools, hotels and so on are going to be built.

No one who has his ear to the ground can see any good excuse for a drop in business activity. There are some forecasters who, on general principles, feel cautious about the future. But they do not give any reasons for feeling doubtful over the next six or eight months.

And, as for money rates, I expect that they will be a little stiffer for the remainder of the year, due in part to the crop movement; but I can see no signs of a substantial increase in interest rates in the near future.

Activity in the field of Contractors and Engineers may then be expected to continue at a high level. The first sign of a coming decline will be the tendency to shop around for lower bids and to be more exacting in the terms and specifications of contracts. This token has already appeared in the east, but it is not yet general over the country.

Sectional Differences in Business

There is a marked difference in the way business men feel in the East and the feeling in the Central West. Out there business men can see nothing but prosperity, while in the east there is a feeling of dissatisfaction in many lines of business. The same difference holds between different industries. Textiles, shoes and a good many automobile companies are feeling blue, while other industries are very rosy. This is one of the plain marks of these rather queer times in business.

Front Cover Illustration

E are indebted to the White Co., Cleveland,
Ohio, for the very interesting illustration
appearing on the front cover of this issue
of CONTRACTORS & ENGINEERS MONTHLY. The
photograph was taken in Sydney, Australia, and

shows motor trucks and steam shovels at work in an excavation for a new bank building on York Street, Sydney. The rock formations in this Australian city are quite similar to those encountered in New York City.

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Several additional photographs of Distributors were received too late for publication on these pages but will appear in the next series

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Deep Wells Stabilized Quicksand on West Palm Beach Water-Works Project

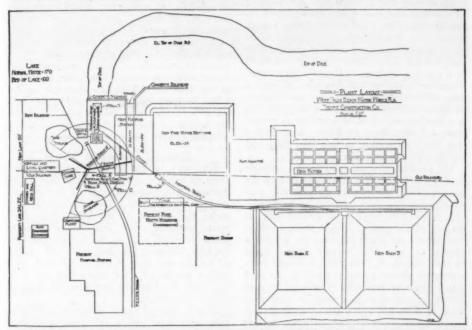
By R. C. WILSON

General Manager, Turner Construction Co., Atlanta, Ga.

THE greatly increased demands of the cities of Palm Beach and West Palm Beach, Fla., for water necessitated an increase in the capacity of the local water-works from six to twenty million gallons per day. Plans for the new plant were prepared by Hazen & Whipple, New York, under the direction of Malcolm Pirnie, and Charles Ruff acted as Resident Engineer. The Turner Construction Co. were the general contractors. The system of sub-surface drainage used during the construction of the various units of the work was

tion of a powerful compressor plant for the ejection of water from these wells by the air-lift method.

The pumping station is of massive design in reinforced concrete and structural steel, 97 feet long by 72 feet wide. The intaken tunnel and various pipe galleries lie principally underground to a depth of 19 feet, while the superstructure rises to a height of 50 feet above ground level. The pure water reservoir adjacent to the pumping station is 122 by 98 feet in plan and 9 feet, 6 inches, from floor to



GENERAL LAYOUT OF THE NEW WEST PALM BEACH WATER-WORKS, SHOWING ALSO THE LAYOUT USED BY THE TURNER CONSTBUCTION COMPANY IN BUILDING THE PLANT

planned by Mr. Pirnie and the success of the scheme has saved much time and money in the construction of the new plant.

The work consisted principally of the building of a new pumping station, reservoir for pure water, aerators and filters, as well as two large coagulation basins as shown in the sketch of lay-out. Besides the principal unit, there have been many miscellaneous items of work such as the making of new land north and south of the plant, building of roads, railroad sidings, the sinking of wells and the erec-

the springing line of the groined arch roof. The floor of this reservoir is about 8 feet under the adjacent take level and so the roof is loaded with about three feet of earth to overcome the buoyancy of the reservoir when empty. The aerator basin is 100 feet long and 80 feet wide by 8 feet deep. Each of the two filters is 82 by 72 feet in plan and 13 feet deep, while the coagulation basins are 172 by 148 feet in size and 18 feet deep, the floors and sloping sides of these basins being lined with cast-in-place concrete slabs 8 inches thick.

The new pumping station and pure water reservoir, as well as part of the aerators and filters, are being built where at the beginning of the work the site was occupied by Lake Clear. This lake is of considerable extent and 7 or 8 feet deep and forms the principal source of water for the filtration plant. The water level varies somewhat with the different seasons, but generally stands somewhere between plus 17 and plus 18. The excavation for the intake tunnel in the pumping station was carried to a depth of plus 2. Other sections of the pumping station and pure water reservoir are carried to various elevations from plus 8 to plus 12, whereas the excavation for the aerators and filters went to elevation plus 14.

Ouicksand Encountered

As already stated, the site of the majority of this work has until now formed part of the bed of Lake Clear, under about seven feet of water. The soil encountered was clear white silica sand of small and uniform grains. This sand bed had been slightly silted up to a depth of a few feet by deposits from the lake water. Experiments showed that this sand had such a slow settling velocity that it gave an indication of being extremely unstable when subjected to a head of only three or four feet of ground water. Under these conditions it showed a very ready disposition to turn into quicksand and become unmanageable.

The problem of excavation in this unstable sand to a depth of more than 15 feet below the surface of the immediately adjacent lake presented great difficulties unless it was found possible to lower the level of the ground water at the site of the work. A steel sheeted cofferdam around the work did not seem to offer a solution of the problem because while it might be made entirely tight in itself, it seemed from experience already gained in handling this sand that it would be impossible to unwater the area within the cofferdam to a depth of more than three or four feet below the level of the adjacent ground water without softening the bot-

tom to a dangerous degree.

This condition of affairs would not permit unwatering of the hole to a sufficient depth to permit the construction of the great amount of complicated reinforced concrete work which had to be done all the way down to elevation plus 2. The sand was so impervious to the flow of water that it was found impossible to take sufficient water out through ordinary well pipes to greatly affect the level of the ground water and it was finally decided to attempt to lower the ground water level over the site of the work by making use of one 13-inch and two 8-inch wells which the water company

had sunk for an auxiliary supply of pure water when the growing demand had exceeded the ability of the old plant to filter sufficient lake water.

Sand Dike Constructed

A sand dike was placed around the site of the work by means of an electrically driven hydraulic dredge which the owners had constructed on Lake Clear. The dike had a minimum top width of about 20 feet and was carried about four feet above the lake level. The top sand ran on about a six to one slope and gave the dike a very considerable width at the level of the lake bottom. It was necessary to locate the dike so as to give ample working room inside of it because, as was anticipated, the fine sand of which the dike was made streamed badly when the site of the work was unwatered. It was never found necessary, however, to deposit any gravel or crushed stone on the unwatered side of the dike to prevent excessive steraming and the seepage through the dike gradually decreased. As a matter of precaution, a 12-inch gate was placed in the northwest corner of the dike, so that if at any time the sub-surface drainage system failed in operation, the area within the dike could be flooded with lake water to prevent the bottom of the hole developing quicksand with the upward flow of ground water.

Removal of Ground Water

The wells which were in existence were three in number, one 13-inch and two 8-inch diameter, and tapped a layer of coarse shell four or five feet thick located about 90 feet under the surface of the lake. This shell strata permitted a very free flow of water to the wells which were on the easterly shore of the lake. Between this shell strata and the hed of the lake was about 80 feet of fine white sand with a number of small intervening layers of shell with the lake bed somewhat silted up as already mentioned.

It was assumed that it would be possible to take more water out of this shell strata than could seep into it through the lake bed and thus create a condition where the level of the ground water was actually underneath the bed of the lake. This assumption was finally proved correct. These wells had been hooked up to a De Laval 12-inch centrifugal pump. The pump was able to maintain 27 inches of vacuum on a measuring gauge attached to its suction line. The pump had been located at elevation plus 22 and to lower its pumping level, it was moved to a new location at elevation plus 12. At this elevation the four wells furnished it with sufficient water so that it ran to capacity with a suction of 25 inches of mer-



JETTING 3-INCH WOOD SHEETING INTO PLACE ON THE INTAKE TUNNEL OF THE PUMPING STA-TION OF THE WEST PALM BEACH WATER-WORKS

The sand dike is seen in the background and beyond it the lake. Where the mules and excavator are standing the hardness of the sand is noticeable although it is 10 feet below the original surface of the lake and when we took the form of quicksand.

cury and under these conditions was discharging three million gallons per day. It was essential, of course, for this pump never to be shut down as the ground water rose rapidly. The output of the wells was piped directly to the old pure water reservoir and in case that was full, it was by-passed back in the lake.

Another 8-inch well that had been sunk to the shell strata, but which had not been connected up with the pumping system, acted as indicator pipe from which it was possible to determine the level of the ground water from time to time. The level of the water in this indicator well gave a very close check on the reading of the vacuum gauge on the pump. It was possible to reduce the level of the ground water in the sand over the shell strata in the intermediate area of the wells to about elevation zero, the level of the ground water naturally rising gradually as the distance from the wells increased. At the extreme west end of the new pumping station, a distance of about 140 feet from the wells, it was found that the level of the ground water was about plus 6. This was a very unusual situation, when it was considered that the top of the lake immediately adjacent was at about elevation 17 and it showed that the bed of the lake composed of fine white sand and some silt was quite impervious to the seepage of lake water. As soon as the dike was completed and the pumping

system started, it was noticed that the level of the water within the area of the dike began to fall and within a few days stood at a level two or three inches lower than the main body of the lake. Most of the seepage into the enclosed area was through the dike and not up through the bottom and it was decided to increase the height of the dike and thus its density. It was then found possible to unwater the hole down to elevation 8 with no leakage through the bottom and only a slight seepage through the dike.

Excavation for Intake Tunnel

Excavation was carried down to elevation plus 8, at which point 3-inch tongued and grooved sheeting for the intake tunnel was started. This tunnel was 16 feet wide and excavation went down to elevation 2. Fine white sand was encountered and it was possible to jet the sheeting down to elevation zero without recourse to any driving. A top ring and cross braces were put in place and excavation with a one-half yard clamshell within the area of the sheeting was started as shown in one of the accompanying illustrations. As this excavation went on, rings and cross braces were added at 3-foot intervals. The method of sinking this sheeting left a very compact and undisturbed body of sand on both sides of the excavation and little or no leakage took place. A sump hole was dug inside the sheeting to take the

suction line of an 8-inch centrifugal pump, the discharge being piped to the lake. This pump never worked to capacity and finally a double diaphragm gasoline pump discharging through a 4-inch pipe was sufficient to take care of the leakage within the area of the sheeting. Excavation was successfully carried down to elevation 2 and pumped dry with no movement of the sand being noticeable. In fact, the sand presented such a hand surface that it was not indented by bricks supporting the heavy reinforcement for the tunnel floor. It was found possible to deposit the concrete for the 2-inch thick tunnel floor and the side walls with the forms in a dry condition instead of by means

of a Tremie pipe through water as had been anticipated.

The experience gained in placing the sheeting for this intake tunnel showed that wherever possible in water bearing sand an effort should be made to jet the sheeting to its final position prior to starting any excavation. It is a very much cheaper method of sheeting and it has the great advantage of leaving the sand on both sides of the excavation in a very dense condition so that the leakage of water and sand was found to be much less than where sheeting is driven as the excavation proceeds.

ACKNOWLEDGMENT.—Published through the courtesy of the Turner Constructor.

Compatibility on the Job

By W. H. SPINDLER

Formerly Division Engineer, Illinois Division of Highways

ONTRACTORS have advanced tremendously in their ability to build roads faster and better. This is partly due to the more exacting requirements of the engineer but more to the close, competitive bidding which makes scientific methods necessary. In spite of the increasing use of machinery, however, there will always be enough of the "personal element" left to warrant giving it a little study.

With the district or division engineer lies the problem of carefully selecting those resident engineers and inspectors who will develop and draw out the contractor who is reliable but inexperienced, who will make the less reliable contractor toe the mark and like it, and who will urge to greater effort the contractor who is both skillful and reliable. In this way the district engineer can build an enviable record for harmonious accomplishment of results.

For the engineer and contractor to get along is not so difficult as it seems. Personalities, of course, enter in. But of equal importance is the necessity of understanding, which comes only with careful study of the other's problems.

Since jobs nowadays are "planned," with blue prints, specifications, details of plant layout, sequence of operations and schedules of work, etc., made up, and notification by the contractor to the engineer as to dates of commencement of the work and stakes wanted, an understanding of these matters in the beginning and close cooperation between contractor and engineer means getting things done right and with the least amount of friction. The amount of help the engineer should give the contractor in checking his grades, widths of cuts and fills, and other field work depends largely on local condi-

tions and precedent. Setting stakes is a necessary part of the engineer's work, but he can work more effectively if he spends a larger part of his time in inspection and supervision.

Primarily, the contractor is interested in his inances, and promptness in paying partial and nnal estimates is becoming much more common than formerly. Careful record keeping and prompt presentation and payment of bills for extras help to alleviate the trouble. Unless the engineer anticipates changes and corrections ahead of time, he will have a disgruntled contractor to get along with.

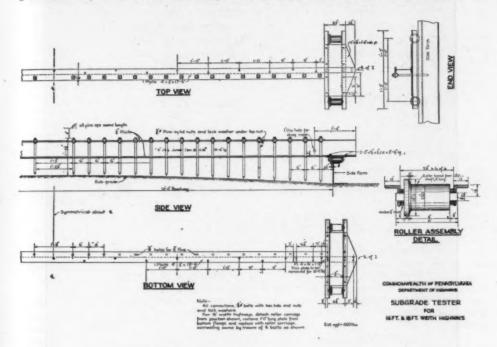
If an inspector is to be efficient and effective, he must remember two things-that he is on the job to inspect, and that the foreman or superintendent is there to produce. How much rennement the contractor must go to, to do the work, should be determined by good engineering practice, precedent, local conditions, and importance of the work, all of which should be reflected in the bid price. The foreman should know what quality of workmanship is required, so that he can produce the results without much effort on the inspector's part. The following suggestions will enable the inspector to get the work done in the best possible manner: know what you want, but be practical and reasonable: know that the foreman knows and understands what you want; be strict; give as few orders as possible, but see that they are carried out; don't nag; be agreeable, but not at the expense of good workmanship; give a word of praise occasionally as well as blame; develop a pride for good work and use common sense.

ACKNOWLEDGMENT .- From an article in The Higheny Magazine.

New Sub-Grade Tester Required by Department of Highways of Pennsylvania

H. CONNELL, Engineering Executive and
Deputy Secretary of Highways, Department of Highways, of Pennsylvania, has announced that a new sub-grade tester will be required on all contracts for which proposals will be received in the future, excepting sections of irregular width, where the old type of standard sub-grade tester may be used. The exact design of

this tester will not be insisted on, but any other one may be submitted to the Department for approval and the general features of size and distance between pins, weight, stiffness and distance between rollers, must conform to those in the illustration. For varying widths of roadway, the weight of the sub-grade tester shall be not less than 22 pounds per foot of width of roadway.



A College Education for the Journeyman

JOE PRUNEAU was the oldest one of a family of twenty-one children. His father was a plasterer and in those days it was difficult enough for a plasterer to make money sufficient to feed and clothe all of these youngsters. It was out of the question for the father to give his children more than the most meager education in the public schools.

But Joe had ideas about an education and found a way to work his way through school. He wanted to study medicine, but he found it impossible to comply with arduous requirements of a standard medical school and at the same time earn enough money to work his way through. So he compromised. He went to Loyola University and entered the school of commerce. Here his record shows that he found time amongst his other numerous duties to play on the football team and to join in the social life. So he not only obtained the schooling but also the education which comes by human

contacts, on the athletic field and in the social life of a university.

Joe was one man who did not think that a college education unfitted him for actual work. Instead of seeking some "white collar" job, he at once entered his father's business of plastering. He became an apprentice and served his four years learning his trade.

Today Joe Pruneau is the chairman of the executive board of Local No. 5 of Chicago. He is also chairman of the joint arbitration board which deals with all matters and agreements between the Union and the contracting plasterers. In an unofficial capacity he is also the most progressive promotion man in the Union. All of those associated with Mr. Pruneau in promoting the Plasters' exhibit at the Own Your Own Home Show had an opportunity to see the patient perseverance and intelligence that made the show possible, entirely through his efforts.

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FIRST PAGE OF THE BILL FOR THE OLD CROTON RESERVOIR, 1843

A Bill for the Old Croton Reservoir, New York City

Reprinted from the Bulletin of the New York Public Library, March, 1927

T would scarcely be fair to say that the Croton reservoir that stood on the present site of the New York Public Library seems as distant in time as the Pyramids, but presentday New Yorkers all feel that the reservoir must have been built a long, long while agoso long that it requires a special effort to realize that any now alive saw the men who did the work, as the reservoir grew from the waste lands of the City commons into a decidedly impressive pile.

Lewis E. Price, of Roselle, New Jersey, however, who recently gave to the New York Public Library the receipted bill his grandfather tendered to the City of New York in December, 1843, for payment for the erection of the reservoir in 1838-1842, feels that his grandfather did not belong to such a distant epoch. The bill was executed in triplicate, one copy for the contractor, Thomson Price and Son, the other two probably for the City and the Board of Water

Commissioners.

The facsimile shown herewith tells in striking fashion how the cost of the work was computed, and furnishes an unusual and emphatic demonstration of the advances in prices of labor and materials in the eighty years and more that

have rolled by.

It is scarcely fair to compare prices set forth on the bill of 1842 with those of this year 1927, unless one compares, at the same time, the specifications on which the two sets of prices were computed. When the excavation began for the reservoir in 1838 the workmen had practically virgin soil, and few changes had taken place since the days when Indians pitched their tents, or Washington retreated as the British landed at Kip's Bay and pushed his troops to the heights of Harlem. Streets and avenues had been laid out, to be sure, but most of the evidence on that point was on the map rather than on the ground. It needs no second thought to realize that digging into the dirt on such a spot, and carting stone and bricks and cement for masonry to be erected under those conditions is an emphatically different story from digging such a hole now on the corner of 42nd Street and Fifth Avenue, taking care of the multitude of pipes and conduits that run beneath the surface. In 1838, the traffic problem in this neighborhood called for no special police detail, and the contractor could be happily indifferent about the number of people and vehicles that might go past his work

at any given time. Care for the traffic would add materially to the cost of any such work done under present conditions.

Earth excavation that then cost \$.23 per yard would not be figured at much less than \$2.35 to \$7.00 now, if it had to be done within city limits and on busy thoroughfares. It was then, to be sure, a matter largely of pick and shovel with horse or mule drawn carts and wagons. With the present-day steam shovels and motor trucks the work would undoubtedly be done much faster, and would cost much less per unit. No doubt the cost this year could be brought near to, if not lower than, the cost of 1838, if hydraulic dredging could be used.

But not on this corner.

Rock excavation that was then set down for \$1.50 would now run from \$5.75 to \$10.50. For the concrete masonry charged for then at the rate of \$5.50 a yard, the bill would now stand at something like \$15 to \$19, and brick work would compare as \$8.50 to \$35 or \$39. White pine then cost \$25 per thousand feet, and now can rarely be bought at less than \$125. Sand and gravel have advanced fom \$1.20 a yard to \$2.00 to \$5.00 Cast brass was figured at \$.50 in 1838 and costs \$1.50 now. Cast iron ran then at \$.085 per pound and now stands at \$.20. Cast steel plays a unique part as the one article costing less now than then, being estimated at \$.31 in 1838 and about \$.20 now. But as only 14 pounds of cast steel were used in the course of the entire work one could scarcely consider it as the dominant feature.

For the two tablets, giving an account of the system and the reservoir, there was a charge of \$221.94 for the marble tablet that now rests in the south wall of the 40th Street corridor of the Library, at the head of the stairs from the 40th Street entrance. The granite tablet now set on the west side of the south corner cost "complete, including setting." \$271.45. It is doubtful if a contractor would engage this year to make and set them for less

than \$1,000 apiece.

Any one who has ever tried to build, will admit that the bill of "extras" always contains more annoying, exasperating, instructive, illuminating items than the regular bill. Of course the "extras" are necessary and must be included if the completed task is to be satisfactory: but every time any of them is mentioned, with that mention comes the query why they could not have been provided for when

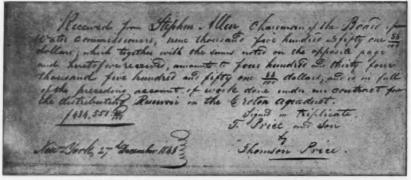
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THIRD PAGE OF THE CROTON RESERVOIR BILL OF 1843



THE POURTH AND CONCLUDING PAGE OF THE CROTON RESERVOIR RILL

the work was first set down on paper. Unquestionably it was better to provide a copper roof (probably for the pent house on top of the north and south dividing wall) rather than use the tin roof called for in specifications. Undoubtedly two steel scrapers for the 5th Avenue entrance were desirable at \$4. Undoubtedly it was well to furnish locks of extra value for the entrance. Undoubtedly it was well to substitute an Egyptian cornice for the square cornice originally specified. Undoubtedly the charge for extras, \$8,639.61, could not be considered excessive, just a bit more than two per cent of the entire cost of the reservoir. But it is equally undoubted that the builder of the present day will feel that some balm is applied to his chagrin over extras, when he realizes that even an engineer like John B. Jervis had to include extras in his final bill.

The bill tells more than that there has been an advance in prices since it was rendered. Compare it with the figures used by the engineer on his preliminary estimate of the cost of the whole system, and we get one more reminder of the difficulty of setting down in black and white any figures for preliminary estimates that equal those recording the final actual outlays. When John B. Jervis, chief engineer of the New York water works, submitted his report to the Board of Water Commissioners of the City of New York on the 12th of December, 1837, he gave a detailed estimate of the cost of the Croton system from the river to the City. He set down his estimate for the distributing reservoir as follows:

10,270 cubic yards embankment at \$.40	
24,000 cubic yards puddled embankment at \$.60	14,400
21,000 cubic yards dry protection wall with facing laid in mortar at \$4.00	84,000
wall at \$6.00	76,680
in cement and stone at \$5.00	20,700
tom of reservoir at \$6.00	10,200
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3,500 cubic yards in division wall at \$6. \$51,000 270 cubic yards masonry in culvert	

3,500 cubic yards in division wall at \$6. \$51,000
270 cubic yards masonry in culvert
and well and well fall at \$15..... 4,050

Influent and effluent pipes and stop-cocks,
with arches for same estimated... 15,000 70,050

\$295,340

In this estimate, to be sure, was no figure for the "Sewers and Wells in 40th and 42nd Streets," that the bill charges \$22,379.24 for, but with this item omitted the cost of the reservoir, as set forth in the second section of the bill, was \$354,669.33, which we must set over against the engineer's estimate of \$295,340.

Suppose that when Thomas Price gave this receipted bill to the City he had been asked what he thought would be on that corner sixty years hence. He would surely have answered that the reservoir would still be standing there. He would have been sure that the work had been made as nearly permanent, not to say eternal, as the skill of his day knew how to make it. And if you had asked what he would expect to see replacing it, granted that it had to go, the chances are that he would have guessed many things before he would have his upon a public library, a place where people might gather for fourteen hours a day to read books.

It is cause for thanksgiving that the expression, "Each floor of a skyscraper costs the life of a man" has already become obsolete. Accident prevention as an effective movement in the construction industry, is still in its infancy.

Organize for safety among your workers at once.



GENERAL VIEW OF THE PLANT OF THE CONSOLIDATED BOCK PRODUCTS COMPANY

A Large Rock Crushing Plant in Florida

By FRANK M. WEAKLEY, B.Mn.E., C.E. Chief Engineer, Consolidated Rock Products Co.

THE plant of the Consolidated Rock Products Co. located two and a half miles east of Brooksville, Hernando Co., Fla., was built to furnish hard rock for concrete aggregate.

The deposit is a part of what is known as the "Tampa Formation" which consists of hard irregular-shaped boulders of all sizes in a matrix of soft lime and clay. The hard rock consists of two types of limestone boulders, one being semi-crystalline, the other compact fossiliferous.

The rock mass is a material that in most states would be considered unfit for working owing to the large proportion of waste and the high cost of cleaning it. The rock as finally produced however, is an excellent aggregate for concete and its production is justified because there is a relatively small amount of good hard rock available in Florida and freight rates on rock from neighboring states makes imported stone expensive.

The big problem to be solved in the production of this rock is its thorough cleansing of all clay and soft lime. Over one and one-half million gallons of water are used daily in the washing. The rock is repeatedly scrubbed, washed and rinsed, and every possible effort is made to get out the best quality of rock produced in the state.

The water is obtained from a well ranging from 22 inches in diameter for the first 140 feet to 12 inches at the bottom, 620 feet deep. The Worthington "Coniflo" pump used has a capacity of about 3,000 gallons per minute pumping from the water level about 85 feet

below the surface up to the tank 100 feet high.

The washings are carried to the sludge pond of over twenty acres, adjoining the plant and after the solids have settled, the water flows about a mile to a 100-acre lake on company property. At the lake are several wells about 6 feet square and 15 feet deep dug to lime rock. Overflow water from the lake goes into these wells and is carried off in crevices in the rock, keeping the water level in the lake nearly constant.

The quarrying of the rock is simple. A 6-inch well drill outfit is used to put down holes which are shot with black powder. A shattering effect is not required, it being necessary to only loosen up the rock mass enough to permit it being dug and loaded into the pit cars with the Bucyrus electric shovel.

The quarry cars are 5 yard side dump and empty directly into a 48-inch by 20-feet long pan feeder marked No. 2 on the accompanying diagram, which feeds into the 30-inch by 60-inch primary crusher. The stone is then fed onto a 36-inch belt conveyor and is carried to the two scrubber screens. These screens have three sections, the first being a scrubber section, the second having 1½-inch perforations and the third having 2½-inch perforations.

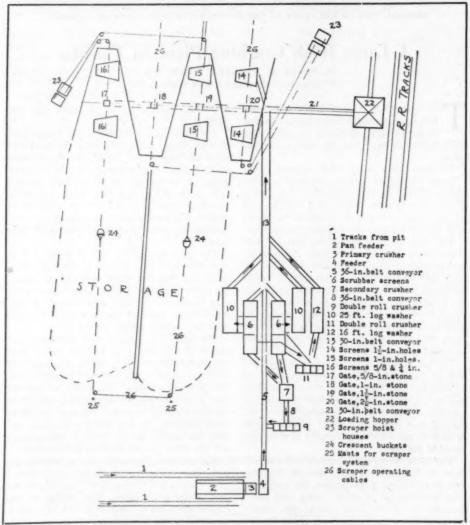
The oversize stone goes to a 24-inch by 50-inch single roll secondary crusher and is carried by a 36-inch belt conveyor to a 24-inch by 54-inch double roll crusher. The product of this crusher drops on to the first 36-inch belt, which carries it to the scrubber screens again.

The 11/4-inch stone from the scrubber screens drops into two Allis-Chalmers 25-foot log washers which wash out the clay and soft lime and discharge on to the 30-inch belt conveyor.

The 2½-inch stone from the scrubber screens feeds into a 24-inch by 48-inch double roll crusher where it is further reduced and falls into an Allis-Chalmers 16-foot log washer which in turn discharges on to the 30-inch belt conveyor.

The stone is carried by conveyor up to the sizing screens and bins. These screens all operate with a large quantity of water and both rinse and size the stone, making four sizes. The sizes made are standard, but screen sections are kept on hand which enable the company to make most any size of stone desired, by changing to the required size of screen perforations.

The open bins are "V" shape, the open ends being designed to permit the use of Sauerman power scrapers for storage and loading from storage. Under the bins is a concrete tunnel in the top of which are gates to control the flow of rock from the bins on to a 30-inch loading belt conveyor. By the control of these gates a



LAYOUT OF THE CONSOLIDATED ROCK PRODUCTS COMPANY PLANT

Crusher BREAKAGE Abolished

The three main parts of a gyratory crusher are the frame, crown and main shaft. Years ago breakage of these parts was expected. Operators considered it as part of the price paid for crushing hard rock.

Telsmith changed all that. Steel is twice as strong as gray iron. Standardizing on the stronger metal, Telsmith guarantees both frame and crown even against breakage by tramp iron. Other manufacturers can, and frequently do, build steel crushers, but all Telsmith crushers are steel and carry the Telsmith Guarantee. This guarantee is unique. It has stood for four years. It is not an experiment but an established institution. It insures you absolute security.

An added protection, equally remarkable, is Tel-smith's unbreakable shaft. A huge steel bolt--enormous in diameter, but very short-it easily withstands shocks that would wreck a lever-shaft. It is easy to guarantee such a massive bolt. Here again the Telsmith Guarantee has unwaveringly stood a four-year test.

In Telsmith construction the three vital partsframe, crown and shaft-stand secure, a permanent investment backed by the iron-clad guarantee of an established reputable manufacturer. Let us give you the details. Ask for Catalog No. 171 (Telsmith Primary Breaker) and Bulletin No. 2F21 (Telsmith Reduction Crusher).

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SCRAPER STARTING TO RECLAIM FROM ONE OF THE STORAGE PILES

mixture of different sizes of rock can be obtained of any desired proportion.

The 30-inch belt conveyor operates from under the gates in the tunnel up to the top of loading hopper. At this point the stone is dumped into a rinsing screen which gives it a

final cleaning and it then drops into the hopper and on through to the railroad cars below, on any of the three tracks.

The tracks connect to both the Atlantic Coast Line Railroad and the Seaboard Air Line Railway which permits shipments being made over either line.

As convenient and economical storage is very necessary, considerable thought was given to this matter. The system finally adopted consists of the open end bins from which and into which the stone is moved with two electric-driven Sauerman power scraper outfits, one outfit operating from each side of the bins, and each outfit being equipped with two Crescent scraper buckets of 2-cublic-yards capacity.

When accumulating rock in storage, the Crescent scraper is fastened to the cable so as to drag the rock to the storage pile out of the bin where it has fallen from the sizing screens above. When loading from the stock piles, the buckets are reversed on the cables and the stone is then dragged back into the bins above the gates where it can drop through to the loading belt. Reversing the buckets is an easy procedure. Two gang cable clips with eves are clamped permanently on the cable in position to fasten to the front and rear bucket bridles. The bridles are fastened to the eyes with clevises. In reversing the buckets, the front clevis is removed and the cable pulled forwards, reversing the position of the bucket; the rear clevis is then unfastened, the cable moved to bring both eye clips in proper position, and the front and rear clevises are then fastened to the eye clips. The entire operation takes about five minutes.

The plant is operated throughout by electricity. The current is transformed from 60,000 volts down to 440 volts, which is the voltage used in the plant equipment.

The maximum output of this plant is about 1,500 tons per 11-hour day.

The Consolidated Rock Products Co. is owned by its President, Wm. P. McDonald, of New York. The Vice-President and General Manager is John E. Ballenger; C. M. Loveland is Plant Superintendent. The general offices of the company are in the Marble Arcade Building, Lakeland, Fla.

While no outside influence can prevent a man from moving so that he may bring an accident and possibly death upon himself, many hazards and conditions inviting accidents may be removed.—General R. C. Marshall, Jr., General Manager, A. G. C.

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(Patents Applied For)

Does the work of six to eight men. Will load a yard of sand, gravel, crushed rock, coal or any loose material in two minutes. The Seven-Cubic-Foot Scoop is operated by a Power Take-Off. Simply back the scoop into the material, press the foot pedal, and it dumps into the body.

Take the loader with you wherever you go. No waiting for extra help or for material delivery. Simply send your man out, and he will be back with a load in a few minutes.

Quick, Efficient Service is worth the investment.

Write for further details and prices

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Legal Points for Contractors

These brief abstracts of court decisions in the contracting fields may aid you in avoiding legal difficulties. Local ordinances or state laws may alter the conditions in your community. If in doubt, consult your own lawyer

Edited by A. L. H. Street, Attorney-at-Law

Items Chargeable Against Tardy

Highway Contractor

Additional expense to which a county is put in maintaining engineers on a highway construction job on account of the contractor's delay in completing the work is chargeable against the contractor, holds the Kentucky Court of Appeals in the case of Maryland Casualty Company vs. Ballard County, 289 South Western Reporter, 316, decided December 17, 1926.

Specifying Patented Materials on Public Work

In passing upon the validity of contracts for public work, the courts frown upon all proceedings that tend to suppress competition. Monopolies should not be fostered at the expense of public funds. But the Appellate Court of Indiana said in the case of Wilkins vs. Newkirk, 155 North Eastern Reporter, 516, decided March 17, 1927:

"It is the law that patented articles cannot be specified to the exclusion of other similar articles, thereby preventing competition, but in this case there is no showing that any of the articles specified were patented. Further, while certain articles are specified as furnishing a standard by which contractors are required to bid, invariably the specifications provide for articles that are similar, in the alternative, in the discretion of the architect and trustee. Such provision does not invalidate the contract."

What Items Are Covered by a Cost-Plus Contract?

"We will convert your dwelling house into a two-family apartment building for cost, plus 15 per cent," said Pennsylvania builders to an owner.

"It's a go," agreed the owner.

But when the job was finished the owner thought that too many items were being run in under the head of "cost," and it took a decision of the Pennsylvania Supreme Court (Johnson vs. Kusminsky, 135 Atlantic Reporter, 220, decided November 22, 1926) to convince him that a lower court had rightly decided the case in favor of plaintiff contractors. The Supreme Court said:

"Plaintiffs were entitled to recover for the material—whatever made up its cost, including cartage, storage, operating expenses, etc. In other words, so they would lose nothing on the material, and in addition recover the 15 per cent profit on both labor and material. This is especially equitable, as one plaintiff spent much time on the job, for which the defendants paid nothing. In a cost-

plus contract, operating expenses are properly included as part of the cost of the material. . . . Where the nature of the case is such that the exact expense of handing the material cannot be shown, it may be estimated."

Employee Must Use His Eyes or Take the Consequences

A road contractor's laborer was carrying a bag of cement across the road to a concrete mixer, when he was struck by a passing automobile that was being driven by an outsider along a space open to travel. Presumably, the motorist was not good for judgment, for the employee sued the construction company for damages, claiming that the company was not sufficiently watchful for his safety. The North Carolina Supreme Court decided that there was no negligence on the part of the company and hence no liability. (Madden vs. J. F. Mulligan Co., 137 South Eastern Reporter, 311, decided March 23, 1927.)

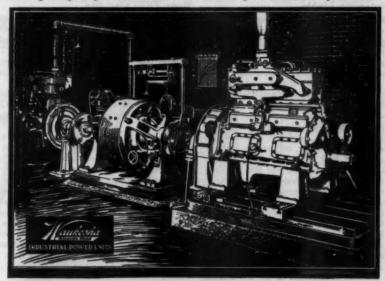
Why Gentlemen Prefer Bonds

A greased pole affords a firmer handhold than a verbal promise to pay a third person's debt. There are good reasons—especially the tendency to avoid opportunities for perjury—supporting the statutory rule of law in force in most, if not all, the states, to the effect that a promise to pay a third party's debt is not enforceable unless it is in writing and signed by the promissor. But, reason or no reason, the rule is firmly fixed. So, in the case of Southside Brick Works, Inc., vs. Anderson, 137 South Eastern Reporter, 371, the Virginia Supreme Court of Appeals decided (March 17, 1927) that, where a contractor had already become indebted to plaintiff for materials furnished for a building, the owner was not bound by a verbal promise to pay the bill.

It was sought to avoid the rule above stated on the ground that the materialman forebore to file a mechanic's lien on the faith of the promise of the owner, who thereby assumed the debt on an independent consideration. But the court ruled that this contention was unsound, in that the materialman had ample time in which to have asserted a lien after being notified that the owner would not pay the bill, and in that the circumstances were such that the

lien would have been unenforceable.

However, the court fully recognizes the rule that where credit is originally extended by one person to another on the faith of a third person's promise to see that the bill is paid, the promise is enforceable, although oral. Testing Heavy Duty Waukesha "Ricardo Head" Engines on Electric Dynamometer



n-716-LC

Getting a Good Start

The race is not always to the swiftest. A good start usually means a successful finish. Waukesha "Ricardo Head" engines have proven that they are a success in the long run - an economical, powerful and dependable friend that will keep your portable air compressors, drag lines, hoists, pumps or power shovels on the job during the busy season. That is because every engine gets a good start thru hours of careful testing under full load on this electric dynamometer which measures its horse power output accurately.

Adjustments can thus be made which assure uniform op-eration of each engine in the field. After their long run, these engines have their under pans removed, and the pis-tons, cylinders and bearings carfully examined, are reas-sembled and given a short run to see that all adjustments are correct before shipment. That's why Wankesha "Ricardo Head" engines get a good start and stand the gaf.

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Leaks In a Concrete Pipe Line Did Not Make Contractor Liable

That one who has contracted to lay a concrete pipe line does not, through the mere making of the contract, impliedly guarantee that there will be no leaks is shown by the decision handed down by the California District Court of Appeal, May 22, 1920, in the case of Johnston vs. Seelye, 251 Pacific Reporter, 646. When sued for the balance due under such a contract, the owner counterclaimed for damages, but was defeated. The Court said:

"It appears that some leaks developed in the sixinch pipe line, which, upon notice, plaintiff repaired, and, when another leak developed, signified his willingness to repair the same, and went to defendants' property for such purpose, but found that defendants had disconnected the pipe line from the intake of water, rendering it impossible for him to make the repair. It further appears from the testimony that, in the construction of the concrete pipe lines, leakage frequently follows the first use thereof, due to contraction which has to be repaired, and hence the leaks in this pipe line were not unusual, but were to be expected. Since plaintiff signified his willingness and stood ready to repair the same, defendants, under the circumstances, are in no position to complain of the work heing improperly done."

Construction Superintendent Was Not Justified in Quitting

A civil engineer was employed as a construction company's general superintendent for one year, or until pending contracts were performed. Before the time was up he quit and later sued for damages claiming that, although he was not discharged the company had been guilty of such breaches of the contract as to justify him in resigning. The trial court decided that he was not warranted in quitting and the Kentucky Court of Appeals, in an opinion handed down February 25, 1927, says that the trial court was right. (291 South Western Reporter, 773.) These are the high spots of the Court of Appeals' decision:

Where the employer requires the employee to do something immoral or dishonorable in connection with his work, or restricts his rights under the employment contract, the employee's act in quitting will not be regarded as a voluntary abandonment of the employment. But merely requesting the superintendent to sign a false financial statement, without insisting that he do so, did not justify his quitting.

Nor did the fact that the company may have been temporarily short of funds, and therefore dishonored the superintendent's drafts for supplies and labor, give him legal ground for quitting. On the contrary, he should have remained on duty and

have done what he could to relieve the situation.

By failing to object to his transfer from one job to another, at the time of the transfer, the superintendent waived the objection and could not later rely upon it as an excuse for quitting, although the transfer operated to reduce his compensation.

"Competitive" Bidding Does Not Require More Than One Bid

"We refuse to pay the paving assessments against our property, because you awarded the paving contract to the only bidder," declared Kentucky property owners to the authorities of a town. "The law requires that such contracts be let on competitive bidding, and one person cannot compete with himself."

But the Kentucky Court of Appeals said in an opinion handed down Febraury 15, 1927, (Blanton vs. Town of Wallin, 291 South Western Reporter, 372).

"After the advertisements for bids were properly published, the board of trustees had the right to consider the only bid that was submitted. . . .

"'A valid ordinance directing the improvement and a valid contract made upon competitive bidding are necessary to the jurisdiction of the council to charge the property owner with the improvement.'

"This is true but competitive bidding means that the council must by due advertisement give opportunity to bid, but it does not mean that more than one bid must be submitted before the council has jurisdiction to make a contract, if it finds the bid satisfactory."

Materialman Had No Right to Sue on This Contractor's Bond

"This company will see to it that the contractor pays all his bills for labor and materials to be furnished in remodeling your hotel at Ironwood, Michigan," said a surety company, in effect, to the owner of the hotel. The contractor forgot-as contractors sometimes will-to pay two material bills aggregating more than \$3,200. The materialmen then looked up the company and requested that the accounts be made good, but the company said, "We never promised you to pay the contractor's bills; we promised the owner that we would protect her. You, Messrs. Materialmen, are outsiders, as far as we are con-They carried their controversy over the point to the United States District Court for the Northwestern District of Michigan. That court decided in favor of the surety company, holding that this contract, being a private one, was not governed by the Michigan statutes relating to public contracts.

The Court said, in an opinion handed down September 17, 1926 (Maryland Casualty Company vs. Johnson, 15 Federal Reporter, 2d Series, 253):

"Bonds securing the faithful performance of contracts between private parties should be construed in accordance with the evident intent of the parties at the time of contracting. To conclude that the clause providing for payment of labor and materials was inserted in the bond here in question for protection of third parties is to indulge an unwarranted confidence in the altruistic motives of those engaged in construction work.

"It seems clear that the object in contemplation of the parties at the time the bond was furnished was to secure to the owner the completion of the building at the contract price and its delivery free from

liens for unpaid labor and materials."

RANSOME PAVER



The Ransome 27-E Paver with which Frank A. Canuso & Son of Philadelphia laid 540 cu, vds. in 12 hours.

In our estimation, our own boy is always the smartest and the best. So isn't it only the out-cropping of old Mother Nature for a paver manufacturer to claim his machine is the "finest," "simplest," "fastest," "sturdiest," "best," etc.? Such general statements sound good, but what you want to know when buying a paver are real facts. Read the specifications of the Ransome 27-E Paver.

RANSOME PAVERS EXCEL

Size of Drum 66" x 54" Water level capacity . 29.3 ca. ft.

Water level capacity . 29
H.P. of engine at 1000
R.P.M. . . 50

Traction Shaft 4%" Size Countershaft 3%"

Material in Roller Tracks ...

. HighCarbon Forged Steel

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Genuine Car Wheels

Are clutches interchangeable 1 Diameter of

ameter of dutches .. 15"

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52,000 lbs.

power loading bucket. Length of power loading bucket (position resting on

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NEW JERSEY

A Double-Drum Gasoline Hoist

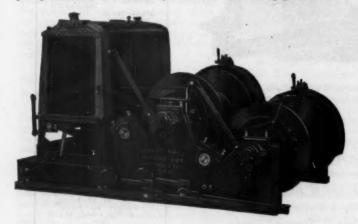
Heavy-Duty Hoist Suitable for Derrick Work, Pile Driving, and General Contractors' Work

A DOUBLE-DRUM gasoline hoist which, according to the manufacturers, when properly applied and conservatively rated, has a wide range of uses, and can be operated and maintained at a very small cost, has been developed by Street Brothers Machine Works, Inc., Chattanooga, Tenn. This gasoline hoist is of the same general design as the Street Standard Electric Hoist. The engine bed plate is so designed as to permit the use of a gasoline engine or any type of electric motor; the only difference in design is in the motor or engine pinion, and in some instances in the countershaft gear.

All hoists above 8 horsepower are furnished with a clutch on the engine drive-shaft for free cranking. The gasoline engines are furnished as a complete power unit with all necessary accessories. On the assembled drum is well balanced. All of the bearings are bronze-bushed and provided with oil pipes.

The gears and pinions have machine-cut teeth, the pinions being machined from steel forgings and the gears of close-grained iron, semi-steel, or steel, as the conditions warrant. All exposed gears and pinions are protected by channel-iron gear guards which protect the rim as well as the face of the gear teeth.

Frictions are of the double "V" type, composed of segments of hardwood securely fastened to the gear wheels and turned to fit the corresponding angle on the drum. The angle of these frictions is so proportioned with the coefficient of friction as to provide the maximum torque consistent with free disengagement.



A
STREET BROTHERS
DOUBLE
DRUM
GASOLINE HOIST
FOR
DERRICK WORK,
PILE DRIVING
AND
GENERAL
CONTRACTORS'
WORK

large sizes the magneto is furnished with an im-

All hoists, except Type "B.B." Small Builders' Hoist, are furnished with an improved screw and pin thrust mechanism and hardwood cone frictions. The Type "B.B." hoist is furnished with outside contracting band friction. The drums are bronze-bushed.

The side frames on all Street gasoline hoists are cast in one piece and are connected by a cénter tie and motor base. Joints are accurately machined and secured by fitted through bolts. The shafts are unusually large and made of high-grade steel, turned and polished. The brakes are generously proportioned, easily adjusted, and lined with woven asbestos.

The drums, 14×26 inches and larger, are built in three parts and securely fastened together by large through bolts. Barrels, flanges, frictions, and brake surfaces are accurately turned and faced and

For drag scraper work, the upper drum for the outhaul line is furnished larger in diameter so as to give a line speed of approximately 350 feet per minute. A pinion is interposed between the drum gears so that hoisting lines will lead off the top of both drum barrels. A third drum or derrick swing gear, or both, may be added at any time. Substantial one-piece side frames are standard equipment on all gasoline hoists above 15 horse-power.

All Street hoists are built on the duplicate parts system, jigs and templates being used throughout. Every gasoline hoisting unit is completely assembled and thoroughly tested under full load in the plant before shipping. An instruction book is furnished with the engines. The extra heavy construction of these gasoline hoists, fits them for use around docks, warehouses, quarries and industrial plants, as well as with derricks, and for pile driving and general contracting work.

Throw away the DETOUR SIGNS No long periods of curing after Tarvia construction. No long waits before the new highway can be opened to traffic. When a Tarvia road is "down," it's "open." THE BARRETT COMPANY, L

Please mention the Contractors & Engineers Montre, v-it helps.

An Effective Pneumatic Concrete Breaker

Compressed Air Tools for Heavy and Light Duty Operate Quickly and Cheaply

THE large increase in the use of concrete in construction work and paving, and the greater thickness and solidity of city and highway pavements to withstand heavier traffic requirements, has made it imperative to replace hand tools by mechanical means, for making openings, and for laying or repairing wiring conduits, gas, water or sewer piping. The uses of the Heavy and Light Duty "Busters" made by the Sullivan Machinery

smashes the hardest concrete quickly, is economical of air at all pressures, and runs with but little vibration, thus reducing the fatigue of the operator in handling.

The "DW-221" uses 11/6-inch steel with plain hexagonal collar shank, and 3/4-inch air hose and connections. The following features are characteristic of both the "DW-221" and of the "DP-221" light Buster: 1, valve and piston motion, utilizing



SULLIVAN
"BUSTERS"
REMOVING
OLD CONCRETE
AND BRICK
POUNDATIONS

Co., 162 South Michigan Avenue, Chicago, Ill., are varied and include breaking up concrete pavements and cutting asphalt, demolishing foundations and cutting out reinforcing bars, wrecking buildings and old retaining walls, excavating hard pan, shale or frozen ground in trenches, cellars or pits, back-fill tamping in trenches in which the quantities involved do not warrant purchasing special tamping tools, driving sheet piling, shallow rock drilling, obviating the purchase of a hammer drill, and odd jobs too numerous and varied to classify.

These tools are speedy, convenient and economical. Users state that the tools save from two-thirds to five-sixths of the time required for hand labor on a given job, thus reducing the number of men needed, as well as the time. Another element of economy lies in the fact that a straight, even break is secured in the concrete, and no more material is removed than required.

The portable character of the Buster enables it to be used to advantage in confined space and to break out asphalt or concrete between railroad ties, along rails, between girders, and in other cramped quarters where men and hand sledges could not operate conveniently.

The "DW-221" Buster is used for driving light sheet piling, as well as for breaking concrete. For this purpose a driving tool is furnished consisting of a hexagonal 1½-inch steel rod, having a taper fit into the head, which has a slot 2 inches wide by 6 inches long. The overall length of the rod and head is 22½ inches. The heavy duty Buster weighs 75 pounds and is powerful enough for the heaviest kind of concrete breaking work. It



PNEUMATIC "BUSTER" USED AS A SHEET PILE DRIVER BY DAVIS, HUNT & CO., CONTRACTORS FOR THE LIGGETT BUILDING IN DAYTON

Patch concrete roads quickly cure with SOLVAY



A typical patching job with [Solvay.]

TRAFFIC conditions frequently require rapid curing of many small sections of concrete to repair quicklythepavement surfaces and avoid Use long derepair tours.

The use of Solvay Flake Calcium Chloride as an admixture will insure rapid and satisfactory curing of the concrete. Heavy traffic can pass over a Solvay-treated patch in a few hours.

Use Solvay Flake Calcium Chloride in your next repair job—see how easy it is to make perfect patches quickly and without any special apparatus.



Complete specifications for all concrete curing, both surface and integral methods, are in the new Solvay booklet—it's free on request—send the coupon NOW!

SOLVAY SALES CORPORATION 40 RECTOR STREET

Please send me booklet No. 2051 and quote price, and nearest shipping point—no obligation of course

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the Sullivan differential, three-spool, independent valve; 2, automatic differential pressure lubricator; 3, enclosed dust-proof chuck; 4, a substantial steel retainer of very heavy cross section prevents the steel from falling away while being handled; 5, all steel construction.

The automatic pulsation lubricator is located in the rear end of the tool, which also forms the base of the handle. The handle is of the double grip pattern, with a central steel section and two rubber hand grips mounted on a through bolt. The "DP-221" steel retainer is formed of heavy, spring tempered steel, the shock being absorbed by the side rod springs, which are mounted at the lower end of the side rods, holding the drill cylinder, back and chuck housing together.

Splash Lubrication in Steam Shovels

Inspection Twice a Year all That Is Necessary to Keep Machines in Order

HE greatest enemy of steam shovel users-grit laden grease-is entirely eliminated in the crowding and swinging engines of the new Marion Type 7 1yard steam shovel, produced by The Marion Steam Shovel Co., Marion, Ohio. Both of the engines are totally enclosed in oil-tight and dust-proof cases and run in a bath-of oil. Instead of shutting down frequently through the day to grease these enginesand inspecting, adjusting and often repairing them every Sunday-they may be operated continuously for months without the slightest attention. The unique feature that makes possible splash lubrication is a double packing of the piston rod with a space open to the atmosphere between the two glands to prevent any escaping steam to enter the oil chamber.



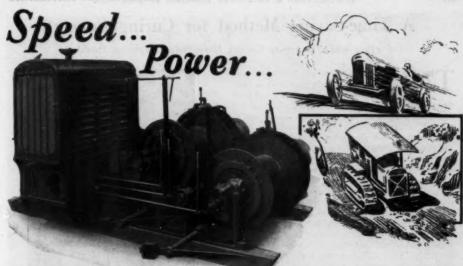
THE MARION STEAM SHOVEL WHICH HAS NEW LUB-BICATING SYSTEM

Gustav Newell, Hammond, Ind., Saved \$45 a Day With This Outfit



THIS TRACKSON PULL-CRAWLER-EQUIPPED FORDSON AND MIAMI SCRAPER REPLACE SIX HORSES AND THREE MIN ON A GRADING JOB

At the right is seen an Allison hoist which Mr. Newell uses for pulling stumps and trees. He states that the outfit pulls as many stumps and trees in four hours as three men and four teams could pull in four days. He also uses the tractor with the Miami scraper for dirt moving. The average hand is about 50 yards and the outfit handles almost a cubic yard of dirt on each trip. One of Mr. Newell's recent jobs was the building of a 10-foot sidewalk where he had a 3½-foot cut and fill to level. In several places he had to clear the right of way through batches of trees and stumps. He kept the outfit working ten hours a day on this job



Brawn for the heavy load Speed for light lifts



To Equipment Distributors

The New Patent Three-Speed Hoist is fully protected by patents in the United States and Canada.

Some open exclusive sales territory is now available.

THE tiny racer roars around the speedway at speeds of 100 and more miles per hour. In the hands of an expert pilot—and at high speeds—the racing car is wonderfully efficient.

Contrast with the flashing speed of the racer, the slow, plodding, powerful march of the caterpillar tractor. It wouldn't make much of a showing on the speedway—but vastly superior when it comes to handling the heavy jobs. Combine the two, and you will visualize the difference between the Mundy Three-Speed Hoist and the old-fashioned hoist.

If the load is comparatively light, it is a waste of power and time to apply cater-

pillar tactics to moving it. Likewise, if the load is a heavy one, racing car tactics will not do, because racing cars are designed for speed alone. And that's where the Mundy Hoist shines—for with the simple shift of a lever—as easy as changing gears on a modern automobile—the Mundy Three-Speed Hoist becomes a "racer" or a "tractor." That's why the Mundy fits every job—because it has a speed adaptable to every load. A folder fully describing this hoist will be sent on request.

The Mundy Sales Corporation

arduters for the J. S. Mundy Hoisting Engine Co. 30 Church St., New York

MUNDY HOISTS

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A Time-Saving Method for Curing Concrete

Surface and Admixture Curing Help Solve Highway Problems

TIME is the one thing, which lost, can never be regained. This important element in construction work often means a loss or gain of thousands of dollars. When a street is closed for any great length of time, it means that trade is stopped, other streets are over-burdened with traffic, motorists suffer inconvenience and loss of time, and fire departments, police patrols and ambulances

are hampered in their work.

A method of curing concrete while mixing it has been developed by The Dow Chemical Co., Midland, Mich., and is now used in practically every state in the country. On account of the fact that calcium chloride accelerates the set of concrete and gives it a higher than normal early strength, it is a decided advantage to incorporate it in the mixing water, which distributes it uniformly throughout the mass. This method provides the moisture for complete and positive curing and gives early strength and acceleration at the same time. If, however, the engineer desires only the curing value of calcium chloride, it may be used on the surface. It supplies moisture on the immediate top, prevents premature drying of the base as well as the surface, and completes the cure. It must be remembered, however, that it is a surface cure just as earth and water are surface cures and the accelerated set will take place on the top of the slab to the point of penetration of the calcium chloride

This proves of value when a careless contractor over-belts or over-tamps his pavement. The accelerated set brings to light this condition much quicker than any other method and makes it possible for the engineer to check up on the contractor before the contractor has received his pay. There are advantages to both methods, but the amount of material needed for the admixture is very little more than for surface curing and the value received is so much greater that the admixture method is recommended as being the more satisfactory, economical and efficient in the end.

In the majority of cases calcium chloride as an admixture is taking the place of surface curing with calcium chloride. Since the curing agent is in the mix, it begins action as soon as poured so that there is no need to wait for the pavement to set enough to hold the spreading machine or to make it safe to apply any coverings. Experimentation by state, government and independent laboratories and field tests has shown that under average conditions 2 pounds of this admixture to every 100 pounds of cement is the proportion that gives the best results. The result of the cooperation of engineers, contractors, manufacturers, and public officials is an apparatus that can be installed by any contractor on practically any of the standard mixers.

The calcium chloride is mixed in an open-top mixing tank, from which the solution is pumped into a storage tank. The storage tank feeds into



ALL PAVERS ARE MADE MORE EFFI-CIENT WHEN CALCIUM CHLORIDE IS USED

a measuring tank which is automatically opened by the skip when it comes up, releasing the proper amount of solution into the mixer drum with the water and as soon as the measuring tank empties the proper amount into the mixer, it is closed and filled up ready for the next batch. This method results in greater economy and ease of handling, assuring a uniform cure because of the fact that the curing agent is thoroughly mixed with the concrete.

Admixture curing might be defined as a combination of both mixing and curing processes. It is simply a matter of adding another ingredient with cement, water and aggregates in place of performing additional and separate operations for the purpose of curing. The newer process not only elininates all other forms of curing but it saves a great deal of expense in the supplying and spreading of earth and the costs of removal. This is exceptionally important in city work where earth must be hauled long distances and where it is equally difficult to dispose of it when the pavement is cleaned off.

With this new method, the pavement is finished when the machine moves on. There is no material to be hauled away or disposed of and this method does not interfere with shaping the shoulder and other grading and similar operations. When one considers the elimination of all of these troubles, plus the elimination of water supply pipe-lines and pumping costs, it is not difficult to understand why admixture curing has become popular.

Le Roi Six Makes Em Dig!

SMOOTHER power, more economical power, surplus power — that's what you get from the Le Roi Heavy Duty Six Cylinder Engine. That's why it is now being used on the heaviest of construction equipment. It boasts of its greater flexibility, greater acceleration, less vibration, — all at a surprisingly low operating cost.

The Le Roi Six is of the valve-in-head design and gets the maximum power out of every explosion. Its force-feed lubrication is fool-proof and trustworthy. "Over-size" working parts and remarkably vibrationless operation assure a long life of service.

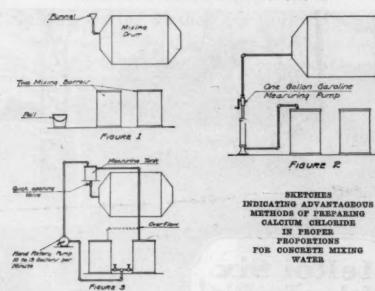
Watch the Le Roi Six. The Shovel shown above is equipped with it. The next time you are buying a piece of heavy duty equipment consider its power — see that it has a Six Cylinder Le Roi. Let us tell you why.

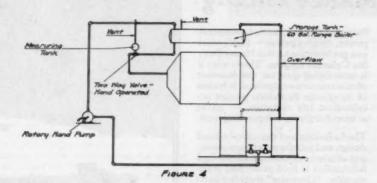
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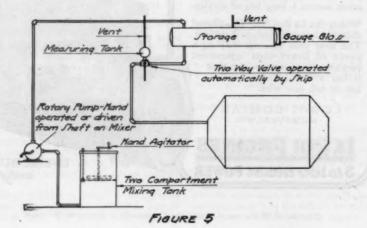
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CHOISTS E



The Clyde two drum steam hoist shown in the illustration is working for the Inter-Lake Construction Co., Detroit, on a contract with Ford Motor Co. to drive 3000 piles, 80 feet long, 12 inches diameter at the butt and 5 inches at the top.

The company advises they drive one pile with a No. I Vulcan hammer in two and a half minutes. An average day's run is 69 piles with a record of 81 in ten hours. The machine must be set for each pile driven.

E. F. Considine is president and J. H. Lowe superintendent of the Inter-Lake Company.

Clyde also manufacturers a complete line of gas and electric hoists. Full details about any unit on request.

> You'll Take Pride In Your Clyde!

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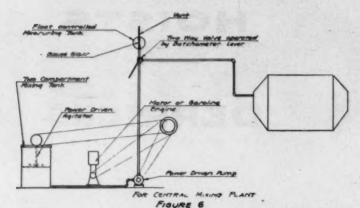
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Please mention the CONTRACTORS & ENGINEERS MONTHLY—it helps,



Instead of curing only the surface of the slab, calcium chloride used as an admixture penetrates the slab through and through, and cures the bottom corner as uniformly as it does the center slab at the top.

One of the simplest forms of mixing apparatus is to use two 60 gallon barrels or drums mounted on a small platform built on the side of the mixer. First place about 35 gallons of water in the barrel and then pour in two 100 pound sacks of the ma-

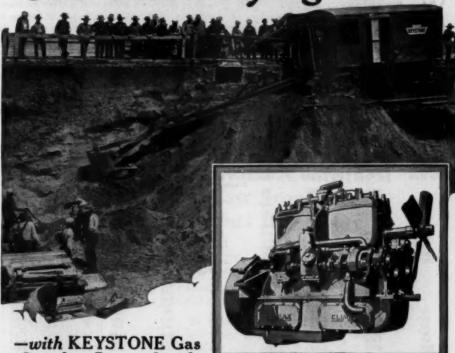
terial. Mix this up thoroughly so that all of it is dissolved, then fill up the drum with water to the 50 gallon mark. From this barrel take as many gallons of solution as is necessary to give the proper percentage, for example, 1 gallon will contain 4 pounds of the material. Another barrel may be used for mixing the solution while using the first barrel. This always gives an additional supply of 50 gallons, so that there is no holding up of the mix in order to have the solution ready.



A SIRIOUS BUILDING COLLAPSE IN NEW YORK VARIOUSLY BLAMED ON AN EXPLOSION OF GASC-LINE AND ON STRUCTURAL WEAKNESS

Witnesses reported that an explosion of some nature was apparently the cause of the destruction of executive effices of the Yellow Taxicab Company, 520 East 23rd Street, New York. The accident was made all the more severe by the breaking of a city water main which flooded the basement and drowned a number of the employes

Another Great Construction Job-Gets a Flying Start



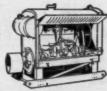


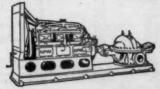
The "Trustworthy" Engine

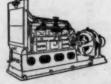
The New Model 4-27 Keystone Gas Crawler, owned by the John Meehan Co., is shown at work on the approach to the New Holland Tunnels in New York. Where there is a big construction job to be done in record time, you will usually find the power used is Climax—the "Trustworthy" Engine.

CLIMAX ENGINEERING COMPANY, Clinton, Iowa

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The same power used by America's leading builders of Cranes, Shooels, Hoists, etc., is also acailable in Cli Portable Power Units, 40 to 140 H. P., and in Pumping Units, Electric Generator Units and other applicati Write for Bulletins on the service in which you are interested.

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Pipe Sizes for Water Lines to Pavers

Data Tabulated by Pennsylvania State Department of Highways for Division and District Engineers and Contractors

H. CONNELL, Engineering Executive and Deputy Secretary of Highways of Pennsylvania, has issued an announcement covering the size of pipe line to be used for the water supply on concrete paving projects in Pennsylvania in the future. This information is based on 50 per cent of the water being required for curing and 50 per cent being required for the mixer and subgrade sprinkling. Providing calcium chloride is used for curing, the amount of water required for lengths paved per hour can be re-

duced one-half. The tables given under the sizes of pipe lines are figured without modifications for head and the table at the bottom of the tabulation gives the information for the correction for head. These requirements start at once so that careful consideration must be given by contractors to the acceptance of rated pump capacities and pressures which will be found in many cases under average working conditions to be only about one-half of the maximum ratings usually given by the manu-

Length Paved	Gals. Water Required	V Feet			Leng	th of Pipe		
Per Hour	Per Hour	Per Second	¾ Mile	1 Mile 2-inch Pipe	1½ Miles	2 Miles	234 Miles	3 Miles
	2000	3.188	79	158	237	316	395	474
	2400	8.825	111	222	333	444	556	667
2.0	2800	4.463	148	296	445	593	741	889
0.0	3200	5.100	190	381	571	761	952	1142
204	3600	5.738	237	474	711	948	1186	1423
50'	4000	6.37	288	577	866	1155	1444	1732
70'	4800	7.65	406	812	1218	1624	2030	2436
80'	5600	8.92	542	1083	1625	2167	2708	3250
90'	6400 7200	10.20	695	1391	2086	2781	3477	4172
100'	8000	11.47	867	1733	2600	3466	4333 5277	5200 6332
100	8000	12.70	1055	2111	3166	4221	0211	0002
	2000	0.000	-	23/2-inch Pip	•	400		***
**	2000 2400	2.233	33	65 91	98	130	163 229	195
2.0	2800	3.126	61	122	137 183	183 244	305	366
0.0	3200	3.572	78	157	235	313	392	470
**	3600	4.019	98	195	293	390	488	586
50"	4000	4.47	119	238	357	476	595	714
60'	4800	5.30	167	335	502	669	836	1004
70'	5600	6.25	223	446	669	893	1116	1339
80'	6400	7.15	286	573	859	1146	1432	1719
90'	7200	8.04	357	714	1071	1428	1785	2142
100'	8000	8.93	435	870	1304	1739	2174	2609
				3-inch Pipe			7	-
	2000	1.448	11	22	33	44	55	66
**	2400	1.737	16	31	47	62	78	93
80 .	2800	2.027	21	41	62	83	104	124
	3200	2.316	27	53	80	106	. 133	159
	. 3600	2.606	33	66	99	132	166	199
80'	4000	2.89	40	80	121	161	201	241
60'	4800	3.47	57	113	170	226	283	339
70'	5600	4.05	75	151	226	302	377	453
80'	6400	4.63	97	194	201	388	485	581
90' 100'	7200	5.21	121	242	362	483	604	725
100.	8000	5.79	147	294	441	588	736	882
Head	Pressure	Head	Pre	ssure Pre	эвиге	Head	Pressure	Head
Ft.	Per Sq. In.	Pt.	Per S	q. In. 'Per	Sq. In,	Ft.	Per Sq. In.	Ft.
10	4	200		87	4	9.2	50	115
20	9	300		30	5	11.5	60	138
30	13	400		74	6	13.8	70	161
40	17	500	21		7	16.1	80	184
50 60	22	600	20		8	18.4	90	207
60	26	700	30		9	20.7	100	230
70 80	30	800 900	31		10	23	200	461
90	39	1000	36		20	46	300 400	691

These tables are based on a requirement of 8000 gallons of water for 100 feet of paving apportioned as follows: ½ for subgrade, ½ for mixer. The pavement is assumed to be 18 feet wide. The head given is based on friction loss along the second of the pipe above the source of supply.

To this must be added the height of the outlet of the pipe above the source of supply.

The formula used is the Hazen-Williams Formula.

H=K Iv 1.87 in which

d 1.25

H =loss of head due to friction
K =.00038

l =length of pipe in feet
V =velocity of water in feet ped
d =diameter of pipe in feet





de Lavaud centrifugal pipe at Orchard Park, New York

deLavaud Centrifugal Cast Iron Pipe costs less to lay



CONTRACTORS have learned by experience the decided saving in handling and laying deLavaud centrifugal pipe.

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Experienced contractors are therefore able to make lower bids, which in some installations average 8% below other pipe.

Engineers and contractors are invited to write for further details. They will be of great assistance in figuring on bids for installations.

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Example (1):

Estimated progress of paving 70 ft, per hour. Water required—5600 gallons per hour.

Maximum water pressure in pump—150 pounds per square inch.

Pipe 2-lach diameter. Pump 12 feet above level of supply. Outlet 40 feet above pump.

How har from the pump can the work be supplied?

150 pounds' pressure =345-foot head as per conversion table.

345—12—40 =293 feet uet head.

The head required for 1 mile of pipe is 1083 feet. Distance water can be supplied = 293 = 14 mile.

Example (2):

Estimated progress of paving—70 feet per hour.

Maximum water pressure in pump—500 pounds per square inch.

Maximum distance water must be forced = 2½ miles.

What size pipe is required?

500 pounds = total water pressure available, which corresponds to 1152 feet head.

2-inch pipe under these conditions requires 2708 feet head or 1175 pounds pressure and is 2½-inch pipe is necessary and requires 1116 feet head, which corresponds to 634 pounds p 2½-inch pipe is necessary and requires 1116 feet head, which corresponds to 634 pounds p 2xample (3):

Example (3):

Estimated progress per hour =90 feet.

Distance water must be forced =3½ miles. What horsepower and pressure are required?

2-inch pipe requires 4333-foot head by table, or 1880 pounds' pressure.

Water required =7200 gailons per hour =2 gailons per second =10.7 pounds per second.

16.7 by 4333 =72.300 feet pounds per second +550 = 13.0 prospower.

2½-inch pipe would require 1785-foot head by table, or 775 pounds' pressure.

3-inch pipe would require 004-foot head by table, or 250 pounds' pressure.

16.7 by 604 + 550 = 18 horsepower.

Value of Craftsman Awards Demonstrated

OR several years the New York Building Congress has presented Craftsman certificates and gold buttons to mechanics who have done superior work in the construction of various New York City structures. The most recent awards were given for outstanding craftsmanship on the Savoy-Plaza Hotel. In making the awards, William O. Ludlow, Vice-President of the Building Congress, called attention to the fact that Barry Ward, a tile roofer, would have received a certificate on this building, had he not already received one for his excellent craftsmanship on another structure. Special commendation was given him

for his splendid work.

On being asked by a reporter if his certificate and gold button had ever been of any practical value, he said, "I was called on a state job in Albany and told the technical man that it could not be done according to plans and specifications. He told me that I should do it that way or get out. I refused to get out and remained on the job to see the man higher up. When he looked at my button he said, 'Oh, you are one of the honor boys. Go ahead and do it your way.'-which I did and I gave the boss a good piece of work which I could not have done otherwise."



MIAMI SCRAPER USED FOR LOADING ONE-TON TRUCKS ON GRADING OPERATIONS John Frants, grading contractor of Sidney, Ohio, has a fleet of three Miami scrapers which he has fulcularly useful and economical in leading trucks from a leading platform. These three scrapers we no a grading operation at Michigan Arenue, Sidney, Ohio, and in twenty hours moved 924 yards of Mr. Frants states, "We hauled this dire over a half-mile through Sidney and creased the Big Four The trucks were held up some by the locals switching. In using the three Miami scrapers, we complatform with two openings, so that the two trucks could stand under it at once and receive their





gan, a part of Michigan State Highway No. 15, was paved in 1920 with asphalt macadam. The asphalt used in the construction was

Stanolind Paving Asphalt

There has been no maintenance on this pavement since it was laid. The above photograph shows that seven years of heavy use have not damaged it in the least.

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A New Jack for Finishing Machine

Facilitates Changing of Wheels on the Job

A SPECIAL jack for mounting the transportation wheels on finishing machines has been developed by The Lakewood Engineering Co., Cleveland, Ohio, manufacturers of screeds and tampers. This jack enables the contractor to remove or install quickly and easily the transportation wheels on the job, an operation which usually requires considerable time.

This jack is a valuable adjunct as it increases the mobility of the finishing machine, making it possible to more quickly move this necessary piece of concrete highway construction equipment to another project. While the transportation wheels can be mounted by lifting the finishing machine with other equipment, the safety of this jack built specially for the work gives added speed and safety to the operation.

The photograph shows how the finisher is raised and lowered.



THE NEW CRANE ATTACHMENT FOR THE LAKEWOOD FINISHER

New Improved Cement Gun Nozzle

Mixing Chamber Assures Thorough Mixing and Hydration

A N improved "Cement-Gun" nozzle has just been put on the market by the Cement-Gun Co., Inc., Allentown, Pa. This nozzle has



THE NEW CEMENT GUN TIP
At left, assembled tip; middle, the liner; at right, the
massembled tip

proved to offer a very great advantage over the nozzle used in the past in that it effects a great reduction in the amount of rebound and at the same time assures more uniform hydration. An important feature of the nozzle is a mixing chamber into which the cementicious material passes immediately after the injection of the water and is thoroughly mixed and hydrated before discharge. All new machines of this company will be equipped with the improved nozzle and it is suggested that present owners equip their machines with them.

This nozzle is used for applying gunite to walls and partitions, and for the repairing of concrete piers, columns, footings, retaining walls and similar structures. It has been thoroughly tested and has proven to offer great advantages over the nozzle used in the past. The new style tip comes in 34-inch, 1-inch and 134-inch sizes, and the new style liner also in 34-inch, 1-inch and 134-inch sizes.



RECENTLY COMPLETED COMBINATION RAILROAD AND HIGHWAY BRIDGE AT FORT MADISON, IOWA
This skew type swing bridge is completely motorized with General Electric motors and controls, covering swing,
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We also manufacture a complete line of All-Steel Tractor Dump Wagons, Extension Reach Trailers, Heavy Transport Trailers, and Snow Plows for all makes and sizes of motor trucks and tractors. Scores of successful contractors are using La-Plant-Choate Bulldozers for refilling trenches and drainage ditches. Nation-wide use of these Bulldozers is evidence of one thing—MERIT! The clinching argument, however, lies in the fact that many of these contractors have seen fit to purchase additional LaPlant-Choate Bulldozers for their various jobs, and their unhesitating choice was the result of the proved merit of the original purchases. Repeat orders for LaPlant-Choate products prove their high worth! Write for Circular No. 22 giving full details of design and construction.

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attachment,

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The Buffalo Springfield Roller Co. Springfield.Ohio.



Carbide Lantern for Construction Watchmen

Large Penetrating Beam Gives Daylight Glow

ALANTERN that is particularly useful for watchmen on construction jobs has been put on the market by the National Carbide Sales Corp., 342 Madison Avenue, New York. It gives an intense white flame of great illuminating power and strong penetration, yet is soft enough to prevent eye strain. It is unusually free from shadows and with well-designed reflectors, the illumination is capable of strong projection.

This lantern has a large base, affording stability, and its construction is substantial and sturdy. A large handle of special design and an extra bail for carrying it on the arm, make it easy to carry on night rounds. A powerful lense of specially made heat-resisting glass is held in place by a strong spring clip, and a safety rear light is provided by a red or green lens fixed in the back of the lantern.

The container at the base of the lamp carries an 8-ounce charge of carbide, enough for eight hours' continuous operation. A supply of water sufficient for the full charge of carbide is carried in the chamber back of the reflector. The burners are easily removed for cleaning or for replacement, and the carbide and water chambers are readily accessible for refilling, with a tight seal between the gas chamber and water chamber, maintained by a heavy thumb screw in the base of the lamp which ensures longer life for the lantern.

The sturdy construction of the lantern fits it for all kinds of service. It has no complicated mechanism to get out of order and any worn or broken parts are easily replaced at small cost.



A STURDY CARBIDE LANTERN FOR CONSTRUCTION WORK

Installing Cylinder Head Gaskets on Gasoline Engine an Important Operation

CYLINDER head gaskets in a heavy duty type of engine such as the Climax engine, made by the Climax Engineering Co., Clinton, Iowa, require more attention than is necessary in the care of the automobile engine. When installing a new gasket on an engine, the operator should proceed as follows:

1-Clean all surfaces.

2—Place gasket on head with the dark side down and shift on studs until all water openings index properly.

3—Put on head and draw the stud nuts down beginning with the nuts in center portion of head until all are just bearing on head.

4—Tighten the nuts gradually, working back and forth across, not around, the head always keeping more tension on the nuts in center portion of head.

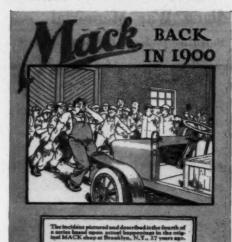
Continue until all nuts are drawn tight.

5—Run engine without load until thoroughly warmed up. Stop and go over all nuts again beginning with the nuts in center portion of head.

6—Tighten nuts frequently and persistently for three or four days until the gasket is finally compressed and nuts can be turned no further. Norn: -This latter procedure should be followed in the case of a new engine going into service.

When heads are removed for grinding valves it is good to install new gaskets although frequently the old gaskets can be successfully used again if not damaged and carefully installed.

Operators who follow these simple rules will avoid engine trouble, which might cause delay and a consequent loss in profits and production time to the engine power.



Breaking in a new hand

ON a bright, sunny morning when all was peaceful and serene in the neighborhood of the little Brooklyn shop, preparations were made to give the starting crank of a new engine its initial whirl.

As in the few previous experiences, there was no long list of volunteers for the job, but finally the conceded "Samson" of the outfit was persuaded that he should accept the honor. When all was ready the victim, with a "zero hour" expression, stepped up to the "iron horse," grasped the crank, whirled it "round and 'round, and yet again, and suddenly there was a report, a back-fire, a general stampede and "Samson's" arm hung limp at his side. When the gallant warrior had been removed to the emergency ward, and order once more restored, it was thought best to fortify the remaining members of the little band with food and stimulants and extend the hour for further hostilities after 1P.M.

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Construction on the Indiana War Memorial

Equipment on This Huge Project Must Give Dependable Service

\$10,000,000 Indiana World War Memorial building is being built in Indianapolis. This huge project will cover three full city blocks when completed. The specifications are extremely rigid, as the cost of the building is being borne equally by the city of Indianapolis, the County of Marion and the State of Indiana.

The contractor, the E. C. Strathmann Co., is using two Novo hoists on the job. The single-drun, hoist, shown in the accompanying photograph, with a 25-horsepower 4-cylinder engine is pulling a concrete hoist bucket containing 12 cubic feet of mixed concrete. The other, a double drum hoist with a 40-horsepower 4-cylinder engine, is working in the background on the other tower. This hoist has drums lagged with wood and is pulling a concrete bucket containing 12 cubic feet of mixed concrete at the rate of more than 300 feet per minute. On the two mixers working on this mammoth building are two more Novo 9-horsepower engines.

These engines can be used in congested districts without objection from anyone, also inside of buildings without damage to the buildings, and they are quiet running. The foundations for the Indiana Memorial contained 425 tons of reinforcing steel, 1,050 tons of structural steel and 11,000 cubic yards of concrete. Certain masses of the concrete must be placed by one continuous pour. One slab alone in the bottom required a non-stop day and night pour of concrete of 50 hours.

A dragline hoisting outfit for digging sand, gravel, etc., from dry banks, down hill or up, from under water or out of rivers where the aggregate some-



SINGLE DRUM NOVO HOIST HANDLING CONCRETE HOIST IN CONSTRUCTION OF WORLD WAR MEMO-RIAL

times runs to large stones or very hard packed substances, is put out by this same company, which introduced its new line of "Roller" engines at the Chicago Road Show.

New Distributor Appointments

Climax Engine Dealers in Wisconsin

THE Wisconsin Foundry & Machine Co., Madison, Wis., are dealers in Climax engines and power units for the western two-thirds of Wisconsin. During the last year they have been very successful in their sales force, maintaining a crew of experienced service men with G. W. Botham, Pres., in charge of engineering and A. J. Buenzli as Sales Manager. This organization also manufactures Wisconsin road machinery, draglines, hoists, sand and gravel bins, conveyors, etc., and handles a complete line of engineers', steamfitters', mill and electrical supplies. It is said they have the most thoroughly equipped foundry, machine and electrical repair shop in southern Wisconsin.

Pacific Coast MultiFoote Distributors

E DWARD R. BACON CO., Folsom and 17th Streets, San Francisco, Calif., general Pacific Coast distributor for MultiFoote concrete paving mixers, manufactured by the Foote Co. of Nunda, N. V., announces that Smith Booth Usher Co., 1910 Santa Fe Avenue, Los Angeles, will act as its dealer in the sale of MultiFoote pavers in southern California and Arizona. The Feenaughty Machinery Co., 309 Yamhill Street, Portland, Ore., and 1028 Sixth Avenue, South, Seattle, Wash., will act as MultiFoote dealers in the Pacific Northwest. MultiFoote pavers are distributed by Edward R. Bacon Co. direct in central and northern California and the Nevada territory.

New Smith Distributor

THE T. L. Smith Co., Milwaukee, Wis., has announced the appointment of the Bublitz Machinery Co., 2139 Washington St., Kansas City, Mo., as distributors for Smith pavers in Kansas and Western Missouri.

Positive, Trouble-Free Hoist Operation

ENTIRELY mechanical, operating on the worm and spur gear principle and enclosed within a case which insures a continuous oil bath for the gears, the action of a Van Dorn mechanical hoist is always positive, smooth and trouble-free. This means continuous operation of the truck, more rapid dumping, more pay loads—more profits.

dumping, more pay loads—more profits.

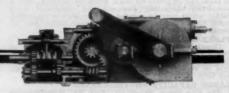
The world's largest builder of mechanical hoists and dump bodies in use by municipalities.

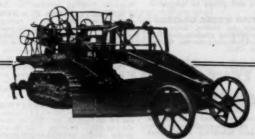
THE VAN DORN IRON WORKS CO. 2685 E. 79th St. DST. 1872 Cleveland, Ohio





Booklets describing the Van Dorn Hoist and Van Dorn Dump Bodies will be promptly sent on request.





SPEARWELL "BIG 8" GRADER-MAINTAINER

Equipped with Road Wheels for high-speed maintenance or Crawler Treads for heavy-duty grading—furnished for the following Tractors—

CATERPILLAR 2-TON, INTERNATIONAL "10-20," JOHN DEERE and FORDSON

A complete standard 8-ft, grader unit with 8-ft, blade, front or rear scarifier and with all standard controls, including blade reverse, operated from driver's platform in the rear.

Write for Illustrated Literature and Prices

-SPEARS-WELLS MACHINERY CO., Inc.



A NEW MODEL POWER ROAD MAINTAINER.

The Avery Power Machinery Co., Peoria, Ill., has announced a new power road maintainer with straight reversible blade and scarifier. The special feature of this maintainer involving the movement of the blade to facilitate light and heavy work is told in literature which may be secured free on request.

THE PROVED VALUE OF CHAIN DRIVE FOR TRUCKS

DRIVE FOR TRUCKS
The first final drive test ever made before the public to show the efficiency of chain drive for motor tracks is completely described, discussed and illustrated in a folder which may be secured free by anyone interested from Mack Trucks, Inc., International Motor Cc., 25 Broadway, New York.

PLAKE GRAPHITE FOR LUBRICATION
Circular 148-C containing complete information on
Dixon's fake graphite, a natural inbricant for cylinders and bearings, coating gaskets, etc., will be sent
free on request by the Joseph Dixon Cruelble Co., Jersey City, N. J.

LARGE CAPACITY SHOVEL-CRANES

The Erie Steam Shovel Co., Erie, Pa., manufacturers
of Erie shovels, cranes, ditchers, draglines, etc., will be
pleased to send complete data and prices to interested
suntractors.

BOAD ROLLERS AND LEANING WHREL GRADERS
Full information and prices on Galion large and
small road rollers and Galion leaning graders and E-Z
lift graders, may be secured by writing to the Galion
Iron Works & Mfg. Co., Galion, Ohio.

The Hercales Motors Corp., Canton, Ohio, will be pleased to send to interested contractors complete data on Hercales engines for all types of contracting and road equipment.

FOR equipment.

FIVE AND SEVEN-TON MOTOR ROLLERS

A complete free catalog issued by the Huber Mfg.
Co., 308 Center St., Marion, Ohio, describes this company's line of five- and seven-ton motor read rollers which have many advantages, such as single lever control, no shifting of goars, clear operating view, short turning and quick action.

ROLLED STEEL BRIDGE PLOOR PLATES

Neverslip rolled steel floor plates in diamond pattern and ribbed pattern to increase the length of life of the bridge floor are completely described and illustrated in a folder issued by the American Pressed Steel Co., Commercial Trust Building, Philadelphis, Pa.

A LOADER THAT COSTS LESS PER DOLLAR

A LOADER THAT COSTS LESS FER DOLLAR.

The Haiss loader which is alightly higher priced than other loaders gives 20 per cent more weight and 50 per cent more engine power with superiority in design, all of which enables the loader with its patented propeller feeding and three-foot-a-minute crowding drive to repay the cost sooner. This loader is completely described in Catalog 5.23 which may be secured from the George Haiss Mfg. Co., Inc., 142nd St. and Park Ave., New York.

This is the title of a 20-page illustrated booklet which has been issued for free distribution by the American Institute of Steel Construction, Inc., 285 Madison Ave., New York, and which tells the story of structural steel in terms understandable by the layman as well as by those versed in the various phases of construction. It tells what qualities are responsible for the cutstanding service performed by steel in the erection of structures of all types from dwellings to bridges and skyserapers. skyserapers.

DEPENDABLE BINS FOR ROAD BUILDIES

Road builders like the Road Paver bin because it is easily erected in a little more than two hours time, and because of its simple design and unit type of construction. An illustrated folder issued by James B. Seaverns Co., Batavia, III., completely describes and illustrates these bins built in capacities of 35, 50, 70 and 100 yards.

IMPROVED METHODS IN HOT ASPHALT MIXERS The "Rotary Pressure Mixer" in which the aggreates can be pre-mixed and the asphalt introduced by spraying under pressure while the aggregates are being cascaded, is fully described in the literature of the American Fin-Mix Co., 3105 S. Michigan Avenue, Chi-

cago, Ill.

A GRADER FOR CURB FORMS
Ted Carr & Co., 999 W. North Avenue, Chicago, Ill.,
makes a grader for curb forms which cuts to exact
chalk-line grade and rolls all the soft spots, making a
solld base for form setting. Further particulars will
be found in the literature of the manufacturer.

A 7-YARD ORAWLEE-TYPE DUMP WAGON
A new all-steel 7-yard dump wagon which is mounted
en Athey wheels and will move over all kinds of soil
without miring, is describing in the literature of the
Western Wheeled Scraper Co., Aurora, Ill.

Western wheeled Scraper Co., actors, in.

A COMCRETE MIXER IN A NEW SIZE
The new 10-8. A. G. C. rating, brought out by The
Lakewood Engineering Co., Cloveland, Ohio, has a bronse
worm gear driven by a heat-treated steel worm conmeeted to either a gasoline engine or electric motor.
Full descriptions will be supplied by the manufacturors. Full descriptions will be supplied by LUBRICATION GUNS AND NIPPLES

Complete information regarding the 'Dot' system of lubrication and 'Dot' guas and nipples that may be applied to any machine, will be furnished by the developers of this system, the Carr Fastener Co., Cambridge, Mass.

A NEW TRENCH EXCAVATING MACHINE
Trenches from 12 to 42 inches wide and 7 feet deep
can be made with the "Public Service Ditcher," brought
out by The Parsons Co., Newton, Iowa, which will
gladly supply additional information regarding this machine, which will dig at either side or in the center.

AN IMPROVED PUMP FOR HEAVY DUTY
A pumping plant with an improved No. 11 triplex
pump with Waukesha 4-cylinder gasoline engine, having
a capacity of 80 gallons per minute, is described in a
pamphlet which will be forwarded by the manufacturers,
the C. H. & E. Mfg. Co., Inc., Clinton & Mineral Sta.,
Milwaukee, Wis.

pamphlet which will be forwarded by the Shankaral Sta, Milwankee, Wis.

A KEW 40-FOOT BELT CONVEYOR

A 40-foot King conveyor, designed for the quick handling of bulk materials, and with special alterations, of mixed cement, has been produced by the Northern Conveyor, & Mfg. Co., Janesville, Wis., which will send further details on request.

HEAVY-AND LIGHT-DUTY CONCRETE BREAKERS

A "Buster," a one-man compressed air tool which is a great time-saver and makes a straight, even break in concrete and may be used in confined places, has been developed by the Sallivan Machinary Co., 102 S. Michigan Ave., Chicago, Ill., which will be pleased to send additional information and pamphlets to contractors.

TRENCH ATTACHMENT FOR TRACTOR SHOVEL

An extension mast, boom and trencher attachment for the Bay City Tractor shovel, which will dig to a depth of 11 feet and is suitable for all kinds of excavation, has a speed of 3 % miles as hear, and is one-man operated is described in the literature of the Bay City Dredge Works, Bay City, Mich.

TRAIL-IT

SEMI-TRAILER-TRACTOR HITCH

Motorizes Horse-Drawn Equipment

REDUCES HAULAGE COSTS

The TRAIL-IT Hitch is used by many Trailer and Wagon manufacturers as standard equipment.





DIRT MOVERS
STREET
DEPARTMENTS
HAULAGE
CONTRACTORS
We can SAVE
you MONEY

TRAIL-IT

Contractors LABORERS X TIME = DOLLARS



Tying Concrete Reinfercing Bars with Wire Tie and Tying Tool

ASK YOUR DEALER

BATES WIRE BAR TIES

Will save you time, labor and dollars.

No skilled labor required to use this equipment.

Two or three turns with tying tool and bars are tied.

Ideal to use in cold weather-men do not have to take off their gloves

Manufactured by

BATES VALVE BAG CO.

8200 So. Chicago Ave. Chicago, Ill. A PAVING AND BUILDING MIXER FOR SMALL JOBS

A new mixer designed especially for small paving jobs, curb or curb and gutter work, large floors to be laid in slabs, and sidewalk work, with a capacity of 30 to 125 yards per day, is fully described in matter that will be mailed to contractors by the Marah-Capron Co., Chicago, Ill.

AN REPROTENT AND ECONOMICAL TRUCK
TRACTOR
The combination of a dump truck and a standard
Forders treator, with a turning radius of 7 feet 4 inches,
and a sepecity of 5,000 pounds has been developed by
the Wehr Co., 530 30th Street, Milwankee, Wis., which
will be pleased to send additional information on

NEW GASOLINE TRUCK AND GRAWLER CHANES
A fall-revolving crane for ordinary hook block, clamshell bucket, dragline, pile-driving and magnet work, mounted on a heavy-duty motor truck chasnis for rapid transportation or on a crawler where greater lifting capacities are required, has been developed by The Browning Orane Co., 16,226 Waterloo Root, Cleveland, Ohio. Full particulars and description will be sent to contractor.

SPLASH LUBRICATION IN STEAM SHOVELS

Grit-laden grease is eliminated in the crowding and awinging engines of the new Marion Type 7 1-yard steam shovel, produced by The Marion Steam Shovel Co., Marion, Ohio. Both engines are totally enclosed in oil-tight and dust-proof cases and run-in a bath of oil. The manufacturers will be glad to send descriptive matter on request.

AN IMPROVED CEMENT GUN NOZZIE

The Cament-Gun Co., Inc., Allentowa, Pa., will forward on request pamphlets containing details of an improved nozzie, which they are new manufacturing, and which effects a great reduction in the amount of rebound, assures more uniform hydration from a thorough mixing chamber, and may be attached to machines now in nac

A REVERSIBLE-TYPE SPRING SCRAPER

A REVERSIBLE-TYPE SPRING SCRAFER
A new reversible-type scraper with an additional
third position, in which the scraper functions as a
smooth gravel spreading maintainer, and which may be
adjusted in a few minutes with a wrench, has been
developed by the Willett Mfg. Co., Third Street and
Turner Avenue, Grand Rapids, Mich., and is fully explained in their literature which they will send to interested contractors and engineers.

A TRACTOR HITCH THAT TURNS EASILY

A considerable saving of time and fuel and an ability to turn in 3 feet are the features of the "E-Z-Turn" tractor hitch manufactured by the Shor-Turn Drawbar Co., Bay City, Mich., which is fully described in a cir-cular of that company to be had on request.

DIPPER TEETH THAT DIG BIG JOBS FASTER
A set of teeth that can be reversed on a 2½-yard
bucket in 5 minutes is the claim of the Western Crucible
Steel Casting Co., 2833 Grand Avenue South, Minneapolis, Minn., for their new "Westeeco" dipper teeth for
steam shovels. The literature of this company, which
will be sent to those interested, says another feature
of these teeth is that they may be reforged after they
have worn dull, and are made in only 3 parts.

INCREASED OUTPUT WITH DRAGLINE BUCKET
Improvements in design have resulted in a new 1½
cubic-yard dragline bucket with hard alloy-steel lips,
trunnion link bushings, and dragline connection bushings, recently developed by the Blaw-Knex Co., 667
Farmers Bank Building, Pittsburgh, Pa. Further
description may be obtained by writing for a catalog.

PAINT GUNS THAT CHANGE COLOR AND STROKE
QUICKLY

QUICKLY
The "'Pneu-Gun'' for painting which saves gallons of paint and days of hard work and which has recently been put on the market by the Mellish-Hayward Co., 211 West Austin Avenue, Chicago, Ill., is fully explained in literature which will be sent to interested contractors on request.

A NEW STYLE OF ROLLER REARING MIXERS
A 30 per cent saving of power and fuel used and
double life is claimed for an entirely new line of roller
bearing concrete mixers, with new features of roller
drive chains, spring shock absorbers, bearings in wheels,
drum shafts and countershafts, and mixing blades,

which are being manufactured by the Republic Iron Works, Tecumsch, Mich. Information regarding this line will gladly be forwarded by the company.

A BUILDERS' SHEAVE ATTACHMENT FOR HOISTS
The Clyde Iron Works Sales Co., Duluth, Minn., will
be pleased to send on request, information regarding a
new builders' sheave attachment for double cage material elevator work, which is mounted on the extended
skids of the hoist and bolted to the front end of the
hoist bed plate, and controlled by a single lever.

AN IMPROVED ONE-BAG CONCRETE MIXER
A circular describing the "5-8 Dandie Speedster,"
which has been built for fast operation, light weight,
compact design and stardy construction and will handle
a one-bag batch of 1:2% 4 concrete, will be sent by
the manufacturors, the Koehring Co., Milwankee, Wis., on request,

A NEW TYPE TRUCK CRANE CRAWLER

The combination of a 4-wheel truck and a crawler track that may be quickly and easily adjusted and which eliminates the fear of soft ground, and necessity for planking and greatly increases the speed of the work has been put en the market by The Universal Crane Co., Cleveland, Ohio. Information and illustrations regarding it will be sent by them to contractors and engineers.

A LIGHT-WEIGHT BLECTRIC HAND SAW

The Wodack electric hand saw which weighs only 24
pounds follows the line perfectly and can be used wherever there is a light seeket is described in the descriptive circular of F. L. Rogers & Co., 29 So. Jefferson St.,
Chicago, Ill., which this company will gladly send on
request.

A DIRECT-CONNECTED LIGHT-WEIGHT SURFACER
The 1927 model Berg Universal concrete surfacer and
finisher which is equipped with a 54-horsepower G. E.
Universal motor and weighs only 12 pounds, is being
sold by the Concrete Surfacing Machinery Co., Dept. F.,
4669-71 Spring Grove Ave., Uncinnati, Ohio, and is
completely described in an illustrated folder which may
be secured free on request.

AND JOIST HANGERS, POST BASES AND

In Catalog 94-B devoted to the building material products manufactured by the Van Dorn Iron Works Co., 2685 E. 79th St., Cleveland, Ohio, contractors will find a remarkably interesting line of anchors, single and double joist hangers, wall beam hangers, post bases and caps, wall boxes and plates.

ALL SIZES OF MIXERS AND PAVERS

The Chain Belt Co., Milwankee, Wis., will be pleased to send complete information and prices regarding its complete line of mixers and pavers in ½-bag to 6-bag capacities, to contractors and others interested.

A SHOVEL CRANE THAT HOLDS ITS LOAD

The Mead-Morrison shovel crane with shovel, ditcher, clamahell, skimmer and dragline attachments, and which is said to hold its load like a derrick, and produce big yardage day after day, is described in Bulletin No. 131, issued by the Mead-Morrison Mfg. Co., 748 Prescott St., Boston, Mass.

GOOD PUMPING EQUIPMENT

The Barnes Primer, issued by the Barnes Mfg. Co., Manafield, Ohio, tells all about Barnes pumps, including Barnes Anti-Splash power disphragm pumps which are sound in design, simple in construction and have easily accessible working parts to insure low operating costs, freedom from breakdowns, delays and costly replacement charges.

A BRIEF ON GYPSUM PLASTER
The Gypsum Industries, 844 Rush St., Chicago, Ill.,
has published a T-page booklet which gives general data
on gypsum plaster, its effect on acoustics and sound
proofing which it will be pleased to send free to any
interested readers on request.

CENTER DRIVER SHOVELS

The Thew Shovel Co., Lorain, Ohio, will be pleased to send complete facts about Thew center drive shovels in steam, electric or gasoline-driven models to interested

CONCRETE ROAD PINISHERS

CONGRETE ROAD FINISHERS
Full information regarding the Ord Concrete Road finisher, in using which stones and pebbles are eaught by the front edge of the screed and rolled or squeezed down into the mass of concrete, thus forcing all air and water pockets out of the road, may be secured from A. W. French & Co., 8440 Lowe Ave., Chicago, Ill.

A Sure Way to Bigger Profits in the Road Building Game-

ROME HIGHLIFT ROAD GRADERS

Bigger profits—the result of time and labor saved—are possible on the majority of jobs where Bome Patented High Lift Graders are used.

They are dependable under all conditions because of their simplicity in design and the endurance of the materials from which they are made.

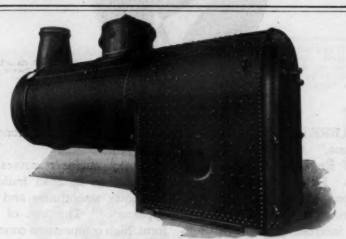
The Frame of structural steel hot-riveted together—and the Heavy Disc Wheels with Timken Eoller Bearings give an unbestable combination

And our own scientifically designed bladeadjusting mechanism, which is a big timesaver itself, is easily worth the price of the whole machine.

There are many other new and valuable features which we should like to tell you about through our catalog, which will be sent gladly on request.

Rome Manufacturing Co.
Locomotive Dept.
ROME, NEW YORK

This illustration shows Blade raised ready for cutting outer bank.



Have you a boiler problem?

JOHNSTON BROS., Inc.

Specializing in Boilers for Contractors' Equipment FERRYSBURG, MICHIGAN

"Install expansion joints at the time of construction"

----says Arizona Engineer



W.W.LANE, Chief Engineer, Arisona Highways Department, Phoeniz, Atisona.

HERE in Maricopa County,
Arizona," said W. W. Lane,
Chief Engineer, Arizona Highways Department, Phoenix,
Arizona, "the construction of
concrete roads presents some
very interesting problems. Sudden wide extremes in temperature make it especially important to provide for expansion

and contraction in our concrete work.

"Every engineer strives for three things in road building: durability, smoothness, and neat appearance. The use of uniform, high compression concrete, properly finished upon a good subgrade, is imperative, but expansion joints, properly designed and installed, must also be used at frequent intervals.

"The use of a premoulded, yielding expansion joint, supplemented with the so-called 'skirt,' adds appreciably to the life and appearance of our Arizona roads. Such provision must be made eventually, and if the joints have to be cut into the concrete after the road is finished, unnecessary delays, labor, and expense are inevitable. Arizona contractors, once hesitant about the use of expansion joints, now appreciate the im-

portance of installing them when the road is first constructed."

Concrete roads in Arizona, as in many other states, are lastingly protected against expansion and contraction stress by Carey Elastite Expansion Joints. The wide use of this material, in view of Arizona's rigid requirements, is a splendid tribute to its efficient service.



Maranette-Hot Springs Highway, Maricopa County, Arizona. 18 feet wide, 6-inch center thickness, and 9 inches thick at the edges—the "Maricopa" type of construction.



THE PHILIP CAREY COMPANY, Lockland, Cincinnati, Ohio

American Steel & Wire

WIRE FABRIC

"The Steel Backbone for Concrete"



City Street and Country Highway Permanent

To reinforce concrete roads with Wire Fabric makes them permanent and is a proven economy. This fact is conclusively brought out in the report of the Highway Research Board, National Research Council.

Made of cold drawn high tensile strength steel, Wire Fabric has proved itself the perfect slab reinforcement. It gives the most effective distribution of steel—the closely spaced wires insuring greatest binding strength, holding the slab together as a solid unit and preventing the development of cracks.

Wire Fabric means permanent reinforcement—longer concrete life—lower maintenance costs. It is furnished in sheets cut to definite size which are easily handled and placed.

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TROCT Four of Fore hour	PETTS BURGET Price Building
OCHMATS Union True Building	PHILADELPHIA
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LOUIS 506 Olive Sures	WORCESTER 94 Grove Store RALYTHOORE 32 Se. Charles Sure
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LANCOKA CITY But Hart Buck Hidg.	WILKELBARRE Micro Sub Side
ACTIVICIAAN Brown-Hurs Blig.	"SAN FRANCISCO
MEPONS Union and Planters Bank Birly.	*LOG ANGELES 3097 E. Sharms Ave
DALLAS Prostorios Sulfilling	SPORTLAND SA A MAN SIN
DENVER First Pleatened Bresk Strip.	THEATTEE 4th Ave. So., & Coon. In
DALT LAKE CITY	Visited Steer Start Product Commerce





KNEE DEEP— IN WET, BLUE CLAY

Down in the mud, crawlers nearly buried, Wilford goes about its work in wet, blue clay. Not a big job, the culvert excavation shown here. Not big enough to make a big shovel profitable. Not enough elbow room to use the big shovel conveniently, anyhow. But too much clay to be removed to make hand digging economical. Wilford cleans it up in short order and is ready for the next job.

Wilford is a quarter-yard shovel, with Fordson power, rugged, dependable, versatile and speedy. Costs but little to buy and operate. Has interchangeable booms for crane, clamshell, dragline and back filler.

Write today for folder No. 3 on interchangeable booms and special combinations with crane, elaminated and backfiller, with and without crawlers. This folder should be in the files of every contractor, angineer and executor.

Universal Power Shovel Co.

WILLIAM FORD, President Detroit

Universal Pipe joints are permanently tights



Before pipe is laid... and after..

- 1. You save the cost of wide trenches.
- 2. You save the cost of digging bell holes.
- You save buying and handling lead, lead substitutes and all other joint-making materials.
- 4. You save the cost of all joint-making equipment.
- 5. You save the cost of high-priced labor.
- You are safeguarded against costly repairs and replacements because there is nothing to deteriorate, nothing in the joints to work loose.
- 7. You are protected against the risk and the inconvenience of leakage.
- 8. You are assured of water supply and fire protection without waste.

cro

THOUSANDS OF MILES OF UNIVERSAL PIPE LAID EVERY YEAR

Labor intelligent enough to use a rachet wrench can make up the machined iron-to-iron joints.

*

The hub and spigot ends of Universal Pipe, machine-tapered at slightly different angles, are drawn into direct contact forming flexible fronto-iron joints that provide for expansion and contraction, vibration and uneven ground sertlement.

Levry joint as right as the wall of the pipe isself.

-

Laid anywhere, in any season—up hill and down, in rock, in sand, in narrow trench—dry or wet, on bridges and under water.

-

Put your water supply, fire protection and sewage disposal problems up to our nearest office.

UNIVERSALASTPIPE

No bell holes to dig: No joints to calk

THE CENTRAL FOUNDRY COMPANY

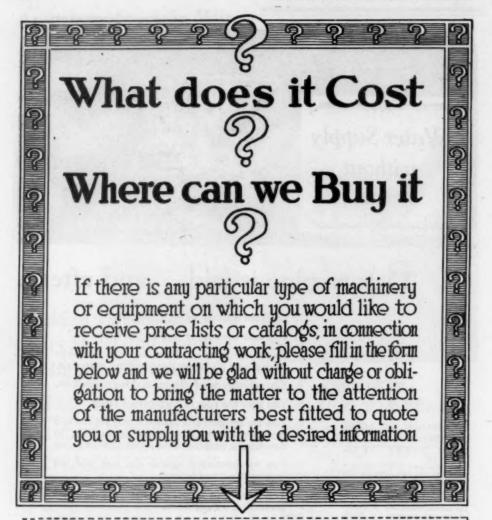
Subsidiary of The Universal Pipe and Radiator Company Graybar Building, 420 Lexington Avenue

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Now York

las San Francisco

XI



Contractors' & Engineers' Monthly 443 Fourth Ave., New York City We would like to receive catalogues and price lists on the following material or equipment

NAME

POSITION .

ADDRESS

A remarkable new backfiller

This new automotive backfiller, operated by the dependable Allison Holes, is so simple that two men can operate the whole outfit. Little wear on cable. Goes anywhere under ow a power. Lightest, strongest Mormon board made, in clud ed as standard equipment. Cut your backfilling costs. Write for literature.





WILLAMETTE IRON & STEEL WORES, PORTLAND, ORE., U.S.A.

Dealers Everywhere

Willamette automotive hoists

ALLISON FOR WILLAMETTE FOR THE FORDSON THE CATERPILLAR

HAITT PORTABLE CONVEYORS



Every contractor will profit by using these rugged machines to cut the cost of hand shoveling. Ball bearing rollers for long life! Other advantages, too.

Ask for Catalog 925

Geo. Haiss Manufacturing Co., Inc. 143rd St. and Rider Ave., New York

Keep the Job Moving

GOOD pumping equipment is a vital necessity for keeping the job moving. Good diaphragm pumps must be built for constant rough and tumble service—ready to work at all times—to pump the way for speedy construction.

Barnes "Anti-Splash" Power Diaphragm Pumps have a proven record for rugged endurance. Sound design, simple construction, easy accessibility of all working parts these distinctive and vital features of Barnes Pumps insure sturdy ability to do the job, low operating costs, freedom from breakdowns, delays and costly replacement charges.

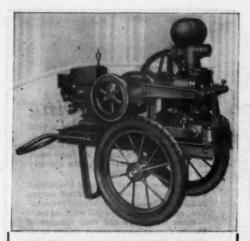
Put Barnes Pumps on your pumping jobs. They will pay you real dividends in dependable service and long life. Ask your distributor.

Write for capy of Bulletin M

THE BARNES MFG. CO. Mansfield, Ohio







BUILT FOR SERVICE

Here's a trailer diaphragm nump that will give continuous, uninterrupted service. The most accessible unit made and easily pertable. Pump also furnished on four steel wheels. Write for Bulletin 283-C

The HUMPHRYES MILE.

Mansfield, Ohio



THE FINEST MONEY CAN BUY

Hyatt roller bearings throughout, roller-drive chain, Dot high-pressure lubrication, malleable wheels, divided type mixing blades, automatic return-everything provided to make it the fastest, easiest operated, most durable mixer built.

non-tilting types.
Dealers carry complete stocks for quick
delivery.
Write for catalog

REPUBLIC IRON WORKS

Tecumseh, Michigan



This newest and fastest of all "27-E" road pumps—the Novo Flud Oild Triplex. Runs at 200 r.p.m. as against the ordinary 65 r.p.m. It pumps up to 110 g. p. m. under 500 pounds pressure. And it weighs from 500 to 900 pounds less than ordinary pumps of equal capacity. The new Novo Pump Book will show you how to eliminate water hold-ups.

NOVO ENGINE COMPANY LANSING, MICHGAN





A Densified Pennsylvania Oil

FOR

Displacing old-fashioned and inefficient cup greases and gear compounds.

"D-A" Lubricant

is especially adapted for use on heavy duty machinery and is sold by distributors of this type of equipment everywhere.

D-A LUBRICANT CO., Inc.

Plant and Home Office:

INDIANAPOLIS - - INDIANA

Yes-we would like you to mention the Contractors & Engineers Monthly.



IT'S EASY TO MOVE EARTH WITH A SCHAEFER

Any man who can drive a car can do it all—controlling all working parts without moving from his seat. Loading, dumping, spreading, leveling—all are done by tractor power. Four sizes: scraper width 4, 5, 6 and 7 feet.

Write for Circular S-26-269

The
GUSTAV SCHAEFER
WAGON COMPANY

4180 Lorain Ave., CLEVELAND, O., U. S. A.

What a TRAYLOR Compressor will do

12 in. x 10 in. Portable Gasoline Engine Driven

1 Will run five (5) pneumatic drills.

WRITE FOR NEW REDUCED PRICES NOW IN EFFECT 2. Will run fourteen (14) chipping hammers and keep the gang busy.

The 40% overload capacity of the motor meets the extra demand.

WRITE FOR NEW REDUCED PRICES NOW IN EFFECT

Their full-ball-bearing-throughout, their efficient water pump, and their large receiver capacity make these double-acting, slow speed compressors unbeatable.

For Rock Drilling and "Cement-Gun" Work

Write for full information.

CEMENT-GUN COMPANY, INC., Allentown, Pa. New York, Pittsburgh, Chicago, Salt Lake City, San Francisco, Seattle, Jacksonville, Fla.

Please mention the CONTRACTORS & ENGINEERS MONTHLY—it helps.



HE BARTON Pump at-THE BARTON Fump attackes to front of any car or truck, and your own engine runs it. It is the most practical outfit ever designed for pumping from ditches, manholes, etc.—wherever drainage or water supply is required. Built sturdy; handles sand, erays or mud without clog-Built sturdy; handles sand, gravel or mud without clog-ging. Furnished complete at very lew price—aaves buying expensive equipment. Do your pumping at lowest cost—with a BAR-TON. Write today for new Bulletin 58 giving complete information.



Every BARTON
Pump is equipped
with Automatic
Primer. When
starting, the pump
primes itself instantly and heaps
primed at all times
— a patented feature found only on
the BARTON.

AMERICAN STEAM PUMP COMPANY
BATTLE CREEK, MICHIGAN

PORTABLE PUMP

HAND BUSH HAMMERS

A size for every bushing and dressing job on concrete.

We would like to acquaint you with the most complete line of Pneumatic tools and chisel equipment for bushing concrete and finishing cast stone.

Hand Points and Chisele Hand and Striking Hammer Drill bits and Hollow Steels

Descriptive matter awaits your call

PHILADELPHIA NEW YORK

CHICAGO

CONNERY'S

Tar and Asphalt Heaters

We manufacture a full line of Tar and Asphalt Heaters, Sand and Gravel Dryers, Oil Burning Heaters, Peuring Pets, etc.



Send for our little "Bine Book" illustrat-ing our many specials in Tar and Asphalt Reaters—we build just what you want, for road work or general construction.

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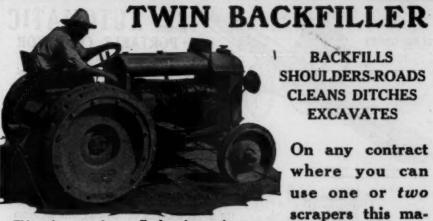
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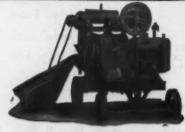
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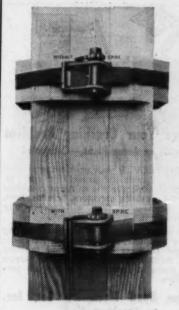
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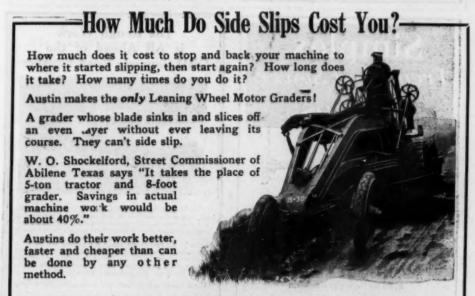
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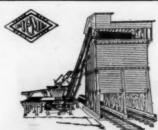
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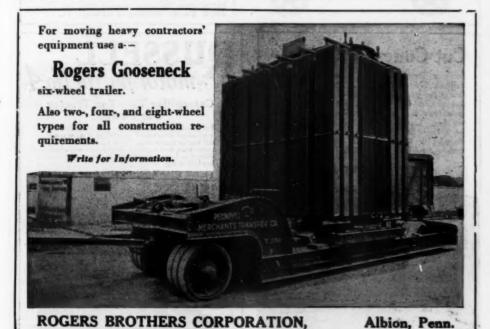
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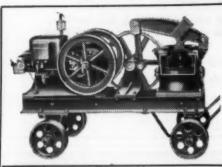
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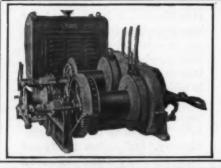
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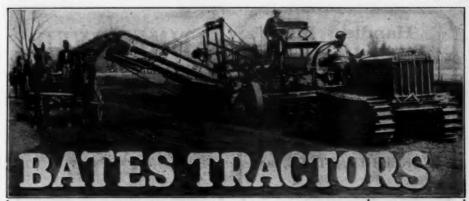
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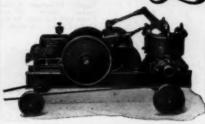
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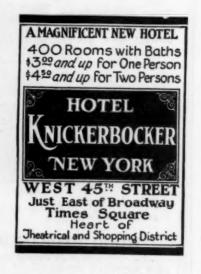


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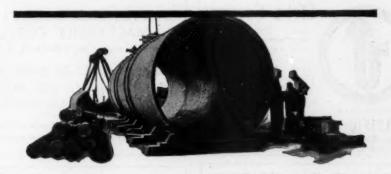
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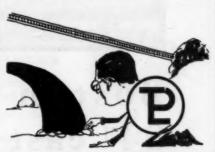
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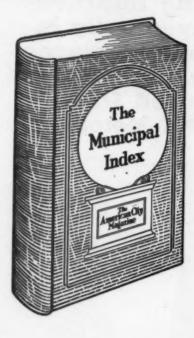
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INVITING BIDS FOR THE CON-STRUCTION OF THE SAN GABRIEL DAM AND APPUR-TENANT STRUCTURES IN THE SAN GABRIEL CANYON

Notice is hereby given that sealed bids will be received by the BOARD OF SUPERVISORS OF THE LOS ANGELES COUNTY FLOOD CONTROL DISTRICT, at the office of the said Beard, in the Hall of Recerds, City of Los Angeles, State of California, up to

2 o'clock P. M., Monday, July 11, 1927 for the construction of the San Gabriel Dam, at the Forks in the San Gabriel Canyon, together with appartenant works, requiring about 1,350,000 calic yards of excavation, the laying of ap-proximately 3,250,000 cubic yards of concrete masonry, and the placing of about 1,300 tons of metal work, together with other related fea-tures, as set forth in the plans and specifications on file in the office of the said Board of Super-visors.

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There are three proposals upon which to bid. Bidders may submit bids upon any or all three proposals, but no bid will be considered for any fractional part of any proposal.

Each bid, which may consist of one or more of the three proposals, must be accompanied by a cashier's check, from a bank in the City of Los Angeles, payable to the Chairman of the Board of Supervisors of the Los Angeles County Floed Control District, for \$200,000.00, as a guaranty that the bidder will, if awarded the contract, execute a satisfactory contract and furnish a bond in the sum of twenty-five (25%) per cent of the amount of his bid, for the faithful performance of the work in accordance with the specifications, and a bond for twenty-five (25%) per cent of the amount of his bid for the payment of laborers and materialmen, said bonds to be approved by the Board of Supervisors. The premiums for above bonds will be paid by the District, and the bidders shall not include in their bids any sum for such purpose.

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Further information will be furnished, and proposal blanks and copies of drawings and specifications may be obtained at the office of the Chief Engineer. Los Angeles County Floed Control District, 202 North Broadway, Los Angeles, California, upon payment of fitty (\$50,00) dollars for each set, which amount will be returned to all bidders if the drawings and specifications are returned in good and acceptable condition within fourteen (14) days after the awarding of the contract.

The proposals must be marked, "Proposal fer Construction of the San Gebriel Dam and Appurtenant Structures," and addressed, "Beard of Supervisors of the Los Angeles County Floed Control District," Room 503, Hall of Records, Los Angeles, California.

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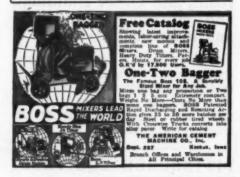


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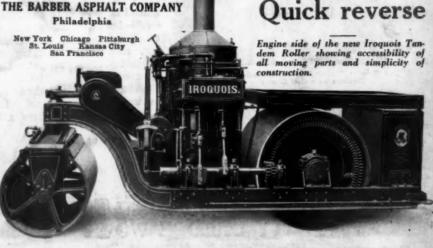
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